Strategic Information Systems Planning (SISP) in Australia: Assessment and Measurement

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole of in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, there has been no editorial work, paid or unpaid, carried out by a third party on this thesis.

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Abstract

Strategic Information Systems Planning (SISP) is an important activity for helping Chief Information Executives (CIOs) and top management identify strategic applications and align Information Technology (IT) with business needs. Like all strategic planning, SISP requires measuring how well SISP is done and how planning is improving over time. The measurement of these intangibles is a complex exercise. There have been few efforts undertaken in the Information Systems (IS) literature to formally develop a model for assessing and measuring SISP efforts.

In this study, two models were proposed: a five-stage SISP maturity model for defining SISP maturity and another one for assessing the degree of SISP maturity. The five SISP maturity levels were defined as: *Rudimentary Planning*, *Ineffectual Planning*, *Attainable Planning*, *Sustainable Planning*, and *Adaptable Planning*. The assessment model was structured as a third-order system, where eight first-order dimensions were termed as *Form and Content*, *Collaboration*, *Policies*, *Stakeholders' Designation*, *Knowledge Bank*, *Technology*, *Time Dimension*, and *Viability*. The first-order dimensions were grouped into three second-order constructs, namely *Effectiveness*, *Efficiency* and *Manoeuvrability*, which ultimately characterise the level of SISP success. This model was used to establish a theoretical benchmark for each SISP maturity level.

To model the level of SISP maturity, an 'Integral Engineering' approach was established and the Analytic Network Process (ANP) theory was used. The study is a novel approach in using ANP to synthesize the measures of the various SISP constructs into a single overall measure of SISP maturity level.

A survey was performed and data collected from 260 Australian organisations to examine the degree of SISP maturity and the relationships among SISP constructs. Structural equation modelling (SEM) was used to test the fit between the hypothesized model and the survey data The models were applied to the data collected and the findings suggested that the models fit the data well.

While *Effectiveness* and *Efficiency* are well recognised planning constructs, *Manoeuvrability* as a measure of planning dynamics is not acknowledged in the literature as an equally important construct. This study confirmed a strong correlation between *Manoeuvrability* and SISP success and found it to be more important than the

Efficiency construct. The empirical data did not confirm the existence of *Rudimentary* and *Ineffectual planning* levels of SISP maturity Australia-wide. SISP maturity in the majority of Australian organisations is at *Sustainable* and *Attainable planning* levels. A small percentage of the surveyed organisations have actually reached the highest planning level (*Adaptable planning*). The empirical data showed that current SISP is lacking strategic dimension and that the recently popularised one-year planning horizon may not be the best choice. Australian organisations did not consider the strategic relevance of IT as the key objective. IT/IS was seen as a business enabler, thus the strategic advantage associated with IT came as a secondary objective.

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LIST OF ABBREVIATIONS

BPR	Business Process Reengineering
BSP	Business Strategic Planning
CA	Competitive Advantage
CEO	Chief Executive Officer
CIO	Chief Information Officer
CSF	Critical Success Factors
EIS	Executive Information Systems
IBM	International Business Machine
IS	Information Systems
IT	Information Technology
IT/IS	Information Technology/Information Strategy
IEW	Information Engineering Work Bench
IW	Information Weapon model strategies
ITI	Information Technology Infra Structure
LAN	Local Area Network
SA	Strategic Alignment
SISP	Strategic Information System Planning
SIS	Strategic Information Systems
ANP	Analytic Network Process
AHP	Analytic Hierarchy Process

GLOSSARY

IT (Information Technology)

The hardware and communications systems that physically make up computing systems. (Holtham, 1992)

IS (Information Systems)

The application software which needs to be developed or introduced –that is the underlying reason for acquiring the hardware. (Holtham, 1992)

IT Infrastructure

An organization's computer hardware and software including: data processing facilities, communication networks, firm-wide applications, databases and messaging services, technology architecture standards, security and disaster planning services. (Broadbent, Weill and St. Clair, 1994)

Business Strategic Planning (BSP)

A process by which corporate objectives for the future are identified in response to perceived opportunities and threats; a process of long-range planning of positioning the organization so that it can prosper in the future.

Strategic Alignment (the linkage of the IS strategy and business strategy)

A collaborative process between the business strategy, the business organization, the IS infrastructure, and the IT strategy. (Baets, 1996)

SISP (Strategic Information Systems Planning)

The process of identifying a portfolio of computer-based applications that will assist an organization in executing its business plans and realizing its business goals. (Lederer and Gardiner, 1992)

A strategic plan for the development of systems towards some future vision of the role of IS in the organization. (Wilson, 1989)

The terms 'Strategic Planning for Information Systems', 'Strategic IS/IT System Planning, and 'Strategic Information Planning Systems' are used interchangeably. Throughout this study, IT and IS terms are differentiated, but when a SISP acronym is used it assumes that both terms are incorporated in it.

SISP Maturity

An organisation achieves the highest stage of SISP maturity if it possesses an IT/IS strategic plan, fully aligned with business goals, which accurately references, at any point in time, current or target IT themes which provide data of high quality, accuracy, availability, and shareability for informed decisions that will give the organisation a competitive advantage. (this study)

SISP maturity, SISP maturity level and SISP maturity stage are used interchangeably.

Competitive Advantage (CA)

Some special capability that will enable the organisation to sustain a position in the market. (Collins and McLaughlin, 1998). Competitive advantage can normally be traced to one of three roots: Superior skills, Superior resources, and Superior position (Mintzberg and Quinn, 1996). The use of the term 'competitive advantage' will refer to the 'competitive' and 'comparative' advantage, i.e. the advantage will not relate to the scale at which it operates (micro-economics, national, regional or a broad geo-political area).

CHAPTER 1

1 INTRODUCTION

It is easy to take over from those do not plan ahead.
(Sun Tzu, as cited by Boar, 1993)

1.1 Background

This thesis reports a research project concerned with modelling the maturity levels in Strategic Information Systems Planning (SISP). Within this project, the study focuses on the assessment and measurement of SISP in small, large and medium Australian organisations, in both the public and private sectors.

Large investments in an ever-developing IT technology inevitably require planning. The need for strategic IS planning is of paramount importance to any organization (Palvia and Palvia, 2003). SISP can help organizations identify where they want to be and get there as well. SISP is seen as ‘the process of identifying a portfolio of computer-based applications to be implemented, which is both highly aligned with corporate strategy and has the ability to create an advantage over competitors’ (Doherty, Marples and Suhaimi, 1999; Lofgren, 2002). Information is an essential asset, but very often unutilised. A number of failures with IT investments and overlooked opportunities have been reported as a result of lack of SISP (Wilson, 1989; Lederer and Sethi, 1996; Lederer and Salmela, 1996; King, 1995; Nash, 2000).

As merely possessing a technology cannot guarantee achievement of business objectives, (usually it just adds more cost and non-value adding expenditure), so the existence of formal SISP doesn’t guarantee success (Raimond, 1992; Willcocks, 1992). At present, business profitability is noticeably in decline, and accountability is a major requirement for SISP practitioners (Pisello, 2001). It is widely acknowledged that the successful CIO is a strategic business partner rather than an infrastructure provider and if the CIO holds strategic responsibilities he/she may significantly contribute to the organisation’s expansion and growth (Dearstyne, 2004).

Previous research reveals that organisations found the assessment of their own SISP strengths and weaknesses (success and failures) a very challenging task (Hackos, 1997; Boar, 1993). Organisations are seeking information about how others (in many instances competitors) are achieving their success. Companies are conscientious of multiple perspectives and very often confused with different concepts that are offered, varying in scope from very specific to too broad and not usable (Westfall, 1999; King and Zmud, 1987; Jarvenpaa and Ives, 2000). To create a more adaptive SISP, calls have been made recently to change a narrow characterisation of the SISP process (Powell and Powell, 2004). Organisations are now seeking new methods for SISP planning as it is getting even more difficult to develop successful strategic plans due to the ever changing internal and external environments (Min, Suh and Kim, 1999; Baets and Galliers, 1998). As consequence, it is vital to consider all the factors involved in SISP planning to achieve SISP objectives.

SISP in its complexity, apart from technological issues, reflects relationships to organisational structure, decision making, culture, learning, performance, customer relationships, globalisation, etc. thus provoke the importance of knowing the evolution stage or 'maturity' of SISP in an organisation.

To develop a model for SISP maturity assessment, the study uses a holistic approach and heuristic thinking for the integration of shared understanding as to what the key dependent constructs of SISP success might be. Recognising the complexity of SISP factors interactions, a theory which provides a new way of thinking and which would enable the research to deal with complex issues by simplifying it in a natural and structured way was sought. Control and systems engineering, system dynamics, and organisational cybernetics were explored. The Analytic Network Process (ANP) and Analytic Hierarchy Process (AHP) theories (Saaty, 2001a) can have a lot to offer for the development of SISP assessment model. As result, this research offers an 'Integral Engineering' approach that integrates the above mentioned theories.

The deployment of well established statistical theories (Factor Analysis, Reliability Analysis, and Structural Equation Modelling) on survey data is a complement to the Integral Engineering approach. The study demonstrates the validity and reliability of multi-item measures and performs a test of fit to see how well the model as a whole fits the data.

1.2 Motivation of the Research

There are numerous empirical (Wilson, 1989; Teo, Ang and Pavri, 1997; Cerpa and Verner 1998; Earl, 1993; Smits, van der Poel and Ribbers, 2003) and prescriptive (Porter, 1985; Boynton. and Zmud, 1987; Lederer and Sethi, 1988; Segars, Grover and Teng, 1998) SISP studies which address questions and dilemmas to help industry. Still, given the increasing proliferation of IT throughout the economy, the derived benefits from IT investments are not adequate (only 8.33 percent of IT spending was perceived to provide incremental benefit to the organisation, Gliedman, 2002). There is some unanimity in existing research claiming that most industrial surveys show considerable dissatisfaction with SISP (Lederer and Sethi, 1996; Nash, 2000; Ward and Peppard, 2002). Also, "the absence of a theory of SISP impedes research in the area" (Lederer and Sethi, 996:237). For a number years, developing and improving an IS Strategic Plan was the number one key issue of IT managers (Table 2.2). There is a call within the SISP literature for improving its methodology, as well as the measurement of the variables involved (Watson et al., 1997; Reich and Benbasat, 2003; Orlikowski and Iacono, 2001; McBride, 1998). The skills to update and put knowledge into practice are needed to improve planning and business activities (Baets and Galliers, 1998).

Practice is still troubled by the immaturity of the research area, and the lack of assessment and measurements of SISP, influenced by 'the understandable reluctance of management to let researchers get too close to the formulation and communication of strategy' (Jarvenpaa and Ives, 2000:297).

Although the implication of not having adequate SISP emerges from these studies, it is still evident that a lack of understanding about what exactly the requirements on SISP should be, in contrast to the requirements on the IT function in departments. Very often SISP is assessed in the light of overall IS function. The SISP literature is surprisingly sparse when it comes to describing what constitutes a superior SISP. This normative question is generally avoided and focus is on plan-making methods and processes. The literature explores the IT stages of growth, but doesn't observe the evolution of SISP as a learning system. SISP is a prime component of the IS/IT departmental function and should be studied in an organisational context but the literature does not include any research that provides a holistic framework for SISP at the 'micro level' (planning per se). Also, there are no attempts to obtain a single overall measure of SISP maturity level. Most of the examined approaches are characterised by a high level of SISP abstraction, focusing on a few SISP dimensions at a time. While this improves specialisation and research manageability, it has the drawbacks of loosing the overall picture of interdependency of the involved elements.

Existing research (Ward and Griffiths, 1996; Galliers and Leidner, 2003) is concerned with planning evolution and plan implementation at a 'macro' context. Two important aspects of SISP are under-emphasized: the planning process (how planning is accomplished) and planning evolution (Grover and Segars, 2005). With reference to the plan itself, the single dimension of the planning content is explored in the extant literature with emphasis on the methods and alignment between businesses and IS strategies. This research adopts and reorganises the existing empirical and theoretical research previously identified but suggests a multidimensional re-conceptualisation of SISP in the light of planning evolution (maturity stages). This re-conceptualisation should lead to a more comprehensive taxonomy of SISP maturity in an organisation.

Measurement plays a crucial role to keep IT aligned with business goals and is ranked as one of the 10 top challenges confronting most IT executives today (Faulkner, 2002). SISP renders many intangible benefits and must incorporate the consideration of these intangible process contributions (King, 1988). The inability to reliably measure costs and benefits is not just frustrating, but is a limiting factor to successful SISP implementation due to the incapability of performing corrective action on time, and enabling IT to learn which initiatives provide the best business value. The need for the improvement of measurement of 'soft' and 'hard' SISP variables is widely acknowledged (Willcocks, 2000; Faulkner, 2002; Sweat, 2002).

Very often, organisations found that the assessment of their own weaknesses is a very challenging task (Hackos, 1997; Boar, 1993). Apart from the idea that it is very hard to be objective about ourselves, it is very difficult to recognise that something we have done for so long in our own way can be done better if done in a different way. Even if we are aware that someone is doing a similar job better than what we are doing it, we still cannot easily obtain information about how others (in many instances competitors) are achieving their success (Hackos, 1997). And perhaps we would like to know what the best practices in our industry are, but we have no resources, time or devotion to find it out.

For these reasons, the establishment of a model that could reflect even to some degree the needs of the general IT professional population is a way of helping industry to position itself in terms of the maturity of strategic IS planning. This in turn can assist in setting new objectives, recognition of key activities which need improvement, or it can help to anticipate the next stage and move sooner to more mature position, or even skip an earlier stage altogether if the benefits of doing that are found.

SISP measurement attempts to identify the degree of SISP maturity dimensions for the purpose of evaluating possible actions. Hence, SISP assessment and measurement can link knowledge and action (policy) and can enable corrective measures to be taken to prevent or reduce the number of failures or to improve return on IS/IT investments.

1.3 Research Aim and Scope

The SISP process is a diverse and complex area of research addressed by many theorists and a few practitioners. No doubt within the IT/IS landscape, the theoretical research is well advanced but still in many aspects lags behind practical needs. The content of the relations among SISP constructs on the variable level remains hidden because of the very conceptual nature of the SISP studies. Today more than ever, it is important that research is relevant, readable, and reachable (Westfall, 1999). Strategic thinking (knowing what is essential, what is secondary, having a sense of unfolding dynamics, addressing core dilemmas, Senge et al., 2002) will be a way for this research to achieve those goals. Governed by these basic principles, this research will try to develop not just another ‘different’ model, but a ‘useful’ model for the current IS/IT practitioners.

As boundaries between organizations become increasingly fuzzy and the scope of our professions cross borders and boundaries, the objective is to integrate the best of the different approaches (and complement each other’s weaknesses) and to transfer analogies from natural and new sciences into theory which enables exploration of new ways of modelling to address the multidimensional perspective of SISP.

IT/IS strategic planning started in the mid 1960s and SISP research is a relatively recent field in comparison with other management domains. Since its introduction, SISP has never been abandoned, and SISP is going to be a long-lasting need within an organisation. As such, the ability to know what to measure (SISP assessment), and the knowledge how to measure (knowing where you are in SISP terms) is a condition for the capability to specify what is to be done (strategy). Assessment is ‘the thorough analysis to decide what to focus on’ (Boar, 1993:93) and models that enables a structured way of SISP assessment will filter the key issues to facilitate decision-making strategy.

The main research question of the study is:

1. *How can the maturity level of organisational strategic information system planning be modelled?*

And resulting from this question, the secondary research questions that emerged are:

1. *What is the degree of SISP maturity in Australian organizations?*
2. *What are the key reasons for the SISP implementation success/failure in Australian organisations?*
3. *What are the best practices in measurement of SISP implementation and how successful is the measurement of SISP in Australian organizations?*

The objectives of the study then are to:

- Not to replicate prior work in SISP area but to build on top of it i.e. where the data throws additional light we will try to extend the existing theory. Make a contribution to the body of knowledge about SISP by providing insights into SISP practices across Australian organizations;
- Bridge the gap of the complex and implicit meaning of the concept of SISP maturity;
- Provide a novel approach to SISP maturity definition;
- Establish a framework for gaining more qualitative insights into the relationships of the criteria/subcriteria influencing SISP processes;
- Explore these relations (theoretically and empirically) to develop a robust, wide-ranging and yet flexible for customisation, dynamic model that capture 'hard and soft' characteristics of SISP planning processes;
- Apply the model developed to assess SISP maturity across Australian organizations;
- Provide a means for organisations to evaluate maturity of their SISP and define improvements through goal refinement;
- Ensure that suggested approaches can minimize the time duration of the SISP process as a long duration can be detrimental to SISP success; and

- Develop a measurement model based on a systems engineering context to measure SISP success which can provide feedforward information for IS planners to make their plans more strategic or provide feedback information for decision-makers to take corrective actions in order to reduce the severity of the problems and thus realize the potential contribution of SISP to organizations.

1.4 Outline of the Thesis

The thesis follows the structure recommended by social and business research (Neuman, 2003; Zikmund, 1997) and comprises 7 chapters. This Chapter is an Introduction which covers the motivation of the research, research questions and objectives. The Chapter finishes with an outline of the study.

The contents of the remaining six chapters are summarized as follows:

Chapter 2 A literature Review of IT/IS Strategic Planning.

After the introduction and definition of SISP, the need, purpose, benefits, importance and success of SISP are discussed. Then, the method for SISP assessment is introduced which governs the SISP literature investigation through a concept of SISP as a system, which is defined by its behaviour, structure and evolution. All the identified dimensions in this analysis are discussed in details, and a number of hypotheses are established to support the proposed framework. The Chapter demonstrates the gap in existing theory, and finishes with a summary of the key dimensions needed for SISP assessment and with an overview of the emerged hypotheses.

Chapter 3 Research Design and Research Methodology.

This Chapter presents the chosen research paradigm, the research design and methods. The chosen non-positivist paradigm governs quantitative data collection through a questionnaire survey. It also explains why an engineering approach with analytic thinking is chosen. The Chapter explains the measurement scales and reports the validity, reliability and other measurement properties of the research instrument. Then, the research techniques AHP/ANP and Structural Equation Modelling are presented.

Chapter 4 SISP Maturity Model.

The main research question of how to model SISP maturity in an organisation is addressed in this chapter. The Chapter starts with the definition of SISP maturity adopted for this research. Then, it delineates each stage of the five-stage proposed SISP model and continues with the definition of the criteria, subcriteria and the factors used for the SISP maturity assessment. The criteria priorities are established to be able measure the SISP maturity levels. For the assessment and measurement of SISP maturity, two models were developed, a Relative Ranking and Absolute Rating model. The former was used to rank each SISP maturity stage and the latter to establish the benchmark against which to measure the maturity level of a particular organisation.

Chapter 5 Structural Equation Modelling: SISP Measurement and Structural Model.

The theoretical concept of SISP maturity is also complementary operationalized within the statistical framework of structural equation modelling through the maximum likelihood estimation. The Chapter presents both, the measurement and the structural model. Also, tests for reliability and validity of the scales used were presented.

Chapter 6 SISP Survey Results.

This Chapter answers the secondary questions based on the SISP survey analysis. The Chapter starts with the analysis of the general characteristics of the surveyed organisations and respondents. Then the results of the SISP maturity assessment in Australian organisations (using ANP/AHP) are presented. The Chapter defines the key reasons for the SISP implementation success/failure and discusses the measurement of SISP. Hypothesises established in Chapter 2 are tested here.

Chapter 7 Conclusion and Future Research.

The thesis concludes with a summary of the survey results, the contribution of the research and limitation of the research. Also, the possibilities for further research in this domain are suggested.

CHAPTER 2

2 A REVIEW of SISP LITERATURE

2.1 Introduction

Aims for a good literature review are identified as 'to demonstrate a familiarity with a body of knowledge and establish credibility; to show the path of prior research and how a current project is linked to it; to integrate and summarize what is known in an area; to learn from others and stimulate new ideas' (Neuman, 2003:96). This study has all these aims. Reviewing SISP experience throughout years of practice provides the knowledge base upon which to define the research model and test hypotheses. The internal and external environments of SISP are analysed to better understand the constructs relevant for the scope of this thesis.

This chapter is structured as follows. First, a definition of SISP is provided and the importance of SISP explained. In this study, SISP is investigated through the concept of a system which is defined by its *behaviour*, *structure* and *evolution*. Special emphasis is placed on the evolution and the structure of SISP to find relevant constructs for assessing SISP. Important SISP constructs such as SISP approaches, methods, techniques and tools are critically assessed. Several other SISP constructs like alignment of SISP and business, key stakeholders are discussed with respect to the key reasons for SISP success/failure.

SISP behaviour, structure and evolution are described to provide the grounding material for defining the hypotheses and to demonstrate the gap in existing knowledge to be addressed by this research. Finally, a summary of the key dimensions needed for SISP assessment and the hypotheses formulated are presented.

2.2 SISP Definition

> *How you gather, manage and use information will determine whether you win or lose.*
>
> (Bill Gates, 1999)

Since the 1960s, SISP has evolved with technology advancement as a distinct theory (Luftman, Levis and Oldach, 1993; Lederer and Salmela, 1996; Elliot and Melhuish, 1995), fully supported with a wide assortment of perspectives and tools, borrowed primarily from the business strategy domain. The meaning of the SISP term has evolved and changed too.

Since organizations are forced to develop ‘plans’ to manage progress of IT/IS technology, they conduct different levels of IS planning, being strategic, tactical and operational (Galliers, 1987). With the fast evolution of IT/IS, as well as environmental uncertainty, organizations are under pressure to develop ‘strategic’ plans, and re-think their way of doing business (Rackoff, Wiseman and Ullrich, 1985).

SISP is often confused with long-range planning or business planning. Traditionally the term ‘Strategic’ planning is associated with long-term planning. However, long-range planning is not ‘strategic’ planning; it translates current activities into a revised activities that will most likely to occur in the future; on the other hand strategic planning tries to create more desirable future by adapting current actions to have favourable influence and outcomes in the external environment (Mintzberg, 1994). IT strategy is not simply derived from the business strategy as the IT strategy is capable of influencing business strategy. Although comparison with business planning offers some insight, SISP as an ongoing activity still demands specialist’s knowledge and repeated studies do not offer a smooth path to success (Ward and Griffiths, 1998).

SISP by its definition has three key words: IS, Planning and Strategy. IS and IT (hardware and software) are objects of planning. Formal planning is as a formalized procedure where future thinking, controlling the future and decision making results in the form of an integrated system of decisions (Mintzberg, 1994). Strategy could be seen as a set of choices (Weill & Ross, 2004). Strategy formation is defined as ‘judgmental designing, intuitive visioning, and emergant learning; it is about transformation as well as perpetuation; it must involve individual cognition and social interaction, cooperation as well as conflict; it has to include analysing before programming after as well as negotiating during; and all of this must be in response to what can be a demanding environment’ (Mintzberg, Ahlstrand and Lampel, 1998:372).

Thus, strategy formation is a complex field (Mintzberg et al., 1998), and probably the reason why many ‘strategic’ plans are not strategic at all (Wexelblat & Srinivasan, 1999). The ‘Strategic’ dimension of SISP is achieved if the plan incorporates ‘strategic thrusts’ such as: differentiation, cost reduction, innovation, growth, and/or alliance, such as forming partnerships or joint ventures (Rackoff et al., 1985 as cited by Galliers, 1987).

Strategic Planning is not a complex process, it is simple but it is not easy (Smith, 1994). A strategic plan is defined as an organized structure for creating the future which has foundation in the present, but describes the architecture of a chosen direction' (Smith, 1994:5). This definition applies both to business and IS planning. Rapid changes in the microeconomic, technological, political, and social environments, force planners to explore innovative approaches to strategic analysis. A sophisticated approach to forecasting is achieved by making short-term plans 'strategic' enough to increase the fit between the organisation and its environment.

IS is commonly substituted for IS strategy. Recently, IS Planning is formally separated from IS Strategy (the plan produces the strategy) (Galliers and Leidner, 2003).

SISP definitions and viewpoints differ, and key ideas about SISP are summarised in Table 2.1.

Table 2.1 Trends of the Key Ideas of SISP

Key Ideas	Sources
A support function to business	Huff and Beattie (1985), Earl (1993), Lederer and Sethi (1991)
To competitive advantage	Porter (1985), Earl (1996), King (1997), Powell (1992), Flynn and Goleniewska (1993), Smits and Poe1 (1996), Doherty et al. (1999), Ward and Peppard (2002)
An emphasis on vision	Wilson (1989)
A strategic alignment with business	Kearns and Lederer (2000), Segars and Grover (1999), Lederer and Salmela (1996), Smits and Poel (1996)
An everyday thinking and re-evaluating process	King (1995), Masifern and Vila (1998)
A partner to business planning	Tanaszi (2002)
Organisations learn from their SISP	Ang et al. (1995), Teo & Ang (2001)

What SISP means differs significantly between authors, prompting a need to consolidate those views and adopt a SISP definition for this research. For this research SISP is de defined as: t*he continuous review of the need for the preparation, acquisition, transfer, storage, retrieval, access, presentation and manipulation of information in all its forms (analogue or digital, wire or wireless, text, graphics, image, data, voice, and video, manual or computer-based) together with the proper selection, implementation, administration and maintenance of the underlying systems (which define the IT capability) to ensure data security, consistency, completeness, and shareability, and accompanied with the tools and techniques of Strategic Planning to achieve organisational business objectives in ever changing internal and external environments.*

Why then is SISP relevant?

2.3 Why Engage in SISP?

The previous section discussed various definitions of SISP. But questions still remain: why plan, why spend time to 'project the future' as this can be a very risky 'game'. Why plan for competitive advantage if it may not be particularly appropriate as the organisation is 'doing well now'? Why not simply continue successful practice? Does formal planning limit creativity of entrepreneurs as forms and procedures replace vision and flexibility? Is it possible to learn how to 'see the future'?

The question of planning, particularly strategic planning has a deep philosophical dimension (Mintzberg, 1981) and it can be seen from different perspectives. In some instances strategic planning is not used to 'conceive an intended strategy but to elaborate the consequences of an intended strategy already conceived', implying that planning may constrain vision and flexibility (Mintzberg, 1981:322).

2.3.1 The Need and the Purpose of SISP

The 1990s have been characterised by the realities of the digital world: super high speed networking, instant messaging, real time communications, digital meetings, constant technological progress, thus accelerating transformations in the organization, starting with their vision, mission, business and IT strategies, structures, and workforce characteristics (Collins and McLaughlin, 1998). With this critical dependency on IT/IS, organisations are responded toward the pronounced need of strategic planning of IT/IS resources. The need for SISP is also present in small and large organisations (Porter, 1998).

There is no disagreement that the purpose of SISP is to gain financial benefit by improving productivity and decision-making. While this is true and beneficial, this is a tactical and short-term response on the crucial question of what the real purpose of SISP is (Boar, 1993). SISP is to enable management to act and react to the dynamics of the environment and to enable management to build, sustain, and compound competitive advantage. Manoeuvrability is the primary business requirement imposed on the IS/IT function (Boar, 1993). In other terms, the purpose of SISP is to gain competitiveness created by information manipulation and that planning is more than just future thinking and decision making (Mintzberg, 1981). SISP is then needed to produce a strategic plan of recommendations that addresses the future needs for IT/IS in accordance with the business objectives in formal or less formal way (Galliers, 1987; Mintzberg, 1994; Hackos, 1997; McBride, 1998).

It is emphasised that strategic importance comes from the strategic use of information (Ward and Griffiths, 1996). The importance of SISP is evident through the following benefits it provides (Doherty, Marples and Suhaimi, 1999):

- Facilitation and integration of the IS function within the organization (King, 1978);
- Supporting the identification of opportunities to use information systems for strategic purposes (Ward, 1987);
- Ensuring that adequate resources are allocated to critical applications (Lederer and Mendelow, 1989); and
- Ensuring that the IS function supports organizational goals and activities at every level (Lederer and Sethi, 1991).

Applications in a SISP portfolio can range from key support, high potential to key operational and strategic applications, depending on their contribution to business success. Strategic applications such as applications which can take the organization into new markets with new competitors and different competitive offerings are critical for the business organization operation. However, most of the time, applications will fall into other portfolio categories, such as high potential or support. This classification was extended and expressed in other terms such as: doing the same –cheaper, doing the same –better, doing something new and adding value, and doing something new to test its potential (McFarlan, 1984); Ward and Griffiths, 1996).

Some authors downplay the importance of SISP and focus on the difficulties of justifying the cost of investments in IT/IS (Raimond, 1992; Willcocks, 1992). In particular, examples where the information system has demonstrated its power to destroy, disrupt and divert the organisation which it serves is discussed (Raimond, 1992). IS systems still have their primary use as a bookkeeping tool rather than a strategic one and in a number cases SISP failed to support business decision-making (Hatten and Hatten, 1997). Consistent with the findings about numerous problems related to SISP (Lederer and Sethy, 1992; Galliers, 1991; Earl, 1993; Segars et al., 1998), some reports actually quantify SISP success; only 24% of planned applications were actually developed (Min, Suh and Kim, 1999), and only 8.33% of IT spending was perceived to provide incremental benefit to the organisation (Gliedman, 2002).

Improving SISP has been one of the top IT management issues because of its capability to bring strategic benefits. Confronted with SISP failures, IT executives reported SISP as important and problematic (Galliers, Merali and Spearing, 1992; Ward and Griffiths, 1996). It is difficult to chronologically reconcile the importance of SISP during the 90s but it can be seen from Table 2.2 that it was the number one issue for business leaders for a number of years. Some argue that there has been a more recent decline in the importance of SISP as a key issue of IS management (Brancheau et al., 1996). This can be explained by the *dot-com* boom (mid 90s to 2000) that inflated IT/IS expectations to the point where an implosion was inevitable. Outsourcing also weakened the position of technology as strategic. Currently, IT is slowly returning to its previous reputation, as a result of the need of many companies to upgrade existing technology. Thus, SISP importance is again one of the top issues facing IT management (Maltz and DeBlois, 2005). Overall, SISP is ranked as the third most important key issue in all seven references mentioned in Table 2.2.

Table 2.2 Trends of the key issues in IT Management

	(1)	(1)	(1)	(1)	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)	
Key Issue	**'92**	**'91**	**'90**	**'89**	**'88**	**'95**	**'88**	**'94**	**'91**	**'05**	**'95**	**'93**	**(rank)** Mean
Aligning IT/IS and Corporate Goals	1	2	4	2	1	9		2	2		6	3	**(1)** 3
Instituting Cross-Functional Information Systems	6	3	3	7		4	3	3			1		**(2)** 4
Re-engineering Business Processes Through IT/IS	2	1	1	11		2	17				3		**(3)** 5
Developing/improving an I/S Strategic Plan	**10**	**6**	**5**	**4**	**2**	**10**	**7**	**1**	**1**	**4**	**14**	**1**	**(3)** 5
Utilizing Data	4	5	7	6	7	7	8	3	8		9	4	**(4)** 6
Creating an Information Architecture	3	8	9	5	5	1	16	3	5	5	5	6	**(4)** 6
Improving the HR Resource	5	13	11	8	8	8	20	3	6	3	2		**(5)** 8
Improving Software Development/maintenance Quality	7	7	14			6	10	9	10		7	8	**(6)** 9
Using IS/IT for Competitive Breakthroughs	14	12	8	1	4	17					12	5	**(6)** 9
Educating Management on IS/IS organisational learning	16	14	2	3	3	14	15				8		**(7)** 9
Integrating Information Systems	13	9	16	12	6	15	1	8	12		11		**(8)** 10
Promoting the IS/IT Function	17	17	15			13		9	3			9	**(9)** 12
Improving Leadership Skills in IS/IT	9	4	6	13	12		13						**(10)** 10
Managing Dispersed Systems	11	11	10	14	17						3		11 (11)
Updating Obsolete Systems	15	19		16	13	3	9						13 (12)
Connecting to Customers and Suppliers	19	20		17				3	3		20		14 (13)
Boosting Software Development Productivity	20	15	19			16	4				15		15 (14)

	(1)	(1)	(1)	(1)	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)	
Key Issue	**'92**	**'91**	**'90**	**'89**	**'88**	**'95**	**'88**	**'94**	**'91**	**'05**	**'95**	**'93**	**(rank)** Mean
Capitalizing on Advances in IS/IT	18		13		18	11					18		16 (N/R)
Data security							6	3	14	2			6 (N/R)
Developing and Managing Electronic Data Interchange	.					19	5					6	10 (N/R)
Planning and Integrating MultiVendor Open Systems						18	14				17		16 (N/R)
Planning and Managing Communication Networks						5	11						8 (N/R)
Instituting Total Quality Management in IS/IT	8	10											9 (N/R)
Cutting IS/IT Costs	12											7	10 (N/R)
Database administration							12					10	11
Measuring IS Effectiveness and Productivity						12	19						16 (N/R)
Funding IT										1			1 (N/R)
Comprehensive planning integration							2						2 (N/R)
Faculty Development, Support, and Training										6			6 (N/R)
E-learning/Distributed Teaching and Learning	.									7			7 (N/R)
Governance, Organization, and Leadership for IT	.									8			8 (N/R)
Enterprise-Level Portals	.									9			9 (N/R)
Web Systems and Services	.									10			10 (N/R)
Data integrity	.						18						18 (N/R)
Determing the value of information systems	.										19		19 (N/R)
Outsourcing Selected Information Services	.					20							20 (N/R)

Source: (1)Boar (1993)
(2) Brancheau et al. (1996)
(3) Caudle et al. (1991)
(4) Watson et al. (1997)
(5) Maltz and DeBlois (2005)
(6) Palvia and Palvia (2003) – Europe 1995
(7) Palvia and Palvia (2003) – Australia 1993
N/R – Not Ranked (Ranking perform only on issues assessed in 6 or more references)

2.3.2 SISP Success and Benefits

The success of SISP is observable in the light of organisation's success. An organization's success is expressed differently depending on varying strategic directions. For some it can be achieving target levels of profit, low-cost competition, seamless supplier and customer relationships, etc. (Porter, 1987 as cited by Teo et al., 1997). Success in managing IS/IT involves both maximizing the return on investment of the money invested in information processing within an organization (Brynjolfsson and Hitt, 1996) and enabling the strategic use of information either to gain competitive advantage (Porter and Miler, 1985) or to understand when they are at risk and what strategic alternatives they have available (McBride, 1998). However, the results of studies that attempt to measure SISP by return on investment or other financial criteria is considered flawed because of their inability to isolate the effect of SISP as one of many contributors to financial performance of an organisation (King, 1988).

SISP implementation has been proposed as a measure of success in SISP (Hartono et al., 2003) and from that aspect, this research targets empirical studies who report the SISP implementation. However this does not diminish the importance of planning processes; the processes of planning and the implementation of plans are equally important (Earl, 1993). The plan itself is the root, if it is ill-defined, the results of its implementation cannot be successful. Also, there is no guarantee that a good plan will be adequately translated into action plans (Hartono et al., 2003; Teo and Ang, 2001).

Also, multi-dimensional, multi-item measures of SISP success were proposed. However, dimensions of SISP success are examined and found that the two dimensions: improvements in SISP capability and fulfilment of SISP objectives were not fully supported because of an overlap of these two concepts, suggesting the use of either of these dimensions (Warr, 2006).

General perceptions on SISP success as well as success rate differ. SISP success is mainly investigated in large companies. In a survey of 500 U.K. companies, (Wilson, 1989) it is found that the competitive advantage gained by SISP implementation was significant, ranging from 26.7% for introduction of new products based on IT, to 83.3% for use of IT to improve product or service performance.

In a survey of 450 firms in Singapore, 92 usable survey results were obtained where SISP was undertaken in 58 firms (Teo et al., 1997). Respondents were asked to rate their degree of satisfaction with the strategic IS plan. Overall, the results showed that the majority of respondents (94%) were satisfied with the strategic IS plan. More than one third of the companies surveyed did not undertake strategic IS planning. Although this percentage has decreased from 52% in the past four years, the authors are of the opinion that it is still relatively high, given the increasing proliferation of IT throughout the economy. It is disturbing that for those who undertake SISP one-fifth do not model their IS plans after the corporate business plans. In terms of other results, this survey found that critical success factors, benefits, and initiations of IS planning in those companies are more or less as expected and are likely to be applicable elsewhere.

SISP enables decisions to be made such as, which IT platform to deploy (e.g. to develop an enterprise wide information architecture, use of distributed data bases, etc.), and outlines hardware and software needs at all levels of systems implementation, and the deployment of third-party applications.

On the other hand, IT alone yields little benefit and:

> '…where IT has been involved in radical business change or transformation of business operations, technology has rarely been the only, or ultimately the most important, factor at work. The genesis of the change project was an analysis of a crippling business problem and search for any solutions, which made sense…' Earl (1992:102)

Research was carried out in a large Australian commercial organization over a period of four years (Cerpa and Verner, 1998). In this organization SISP was monitored from the generating plan phase, through a number of revisions, to the approval and implementation phase. Within four years, the SISP cycle was formalized into an annual process. SISP was perceived as being very important and after four years the benefits were identified as: (1) enhanced competitiveness, (2) helps with survival, (3) flexibility in a changing environment, (4) generation of quality decisions, and (5) facilitation of budgeting processes.

The conclusions drawn from this and many other surveys are similar (Premkumar and King, 1991; Galliers, 1987; Earl, 1990). SISP is perceived as being beneficial and, where implemented, the success rates vary and they can be very high. A success rate of 71% (Galliers, 1987), 76% (Earl, 1990), 44% (Flynn and Goleniewska, 1993), and 98% (Groznik and Kovacic, 2000) was reported. Considering the firm's success with SISP, the typical experience was described as worthwhile but in need of some improvements.

Research (Teo and King, 1996; Wilson, 1989; Flavel and Williams, 1996; Ward and Griffiths, 1998) supports claims for the following benefits of using SISP: alignment with business needs, improved productivity, improved decision making, improved IS department's communication with senior management, improved communication with users, improved communication with customers, insurance that information can be shared and accessed anytime, anywhere, anticipated need for new hardware, and anticipated need for new software applications.

The study then proposes the following hypothesis:

H1: As SISP evolves towards higher maturity levels, the level of SISP benefits will increase.

SISP is a complex phenomena; very important but problematic. As indicated in Chapter 1, this research will use an Integral Engineering approach (fully explained in Chapter 3) to assess SISP. This approach is based on decomposition of a complex system in subsystems for a better understanding of the system's internal processes. To fulfil that goal, this study continues with the definition of a system and its attributes in engineering terms in order to answer the main research question.

2.4 Assessment of SISP

A review of the literature revealed a lack of uniformity in presentation of SISP factors. A limited number of studies tried to present SISP processes in a structured way. The most common method used is a narrative which lacks the clarity of 'a picture' presentation, more especially when it comes to the relationships between SISP factors. There are studies (Wexelblat and Srinivasan, 1999; King, 1988; Hevner, Berndt and Studnicki, 2000) that use a 'box' structure with inputs/outputs for two reasons: (1) to bridge the specification gap (comprehension gap) that causes implementation failures, and (2) to present SISP processes in a structured way (expression gap). These studies confirmed that an engineering approach to SISP is valid and needed. Nevertheless, none of these studies defined SISP in engineering terms. To bridge that gap, the survey of SISP and non-SISP literature was undertaken to find a better way of analysing and presenting SISP.

2.4.1 Definition of a System

If the basic postulates on which to build the research are defined heuristically, the end result could be surprising with the ability to portray complexity in a natural, simplistic way (Kogan, 1988). Without going deep into philosophy, but using groundwork from 'Natural philosophy', the following definitions of a system, an organisational system, and information system are used in this research.

A system is a collection of two or more elements that are dependent of each other for serving some purpose, and because of the internal relationship among elements, the system as whole is more than the sum of its parts (parts + relationships). This statement describes living and non living systems (Simms, 2001). This research selects the Analytic thinking approach as it puts emphasis on analysing a problem in a holistic perspective while studying the simultaneous interactions of its elements.

A system can be defined by its structure, behaviour, and evolution, i.e. being, acting and becoming (Simms, 2001). The structure and organisation of a system are static characteristics while behaviour and evolution are dynamic characteristics. Thus, SISP will be assessed in the light of these three dimensions: its structure, behaviour and evolution.

A fundamental difference between living and non-living systems is the ability of the living system to generate information. SISP is generated as a product of the interaction of people and computers, thus it is capable of generating information. Each system has its own internal environment (relationships between its components). Each system exists in the world (external environment) where it can be considered just as a component (or subsystem) of another larger system. All this applies to SISP as the latter is considered as a subsystem of Information Systems within an organisation.

Systems with less interaction with the 'world' can be considered as 'closed' systems (clear boundaries). A system can be 'open', emphasizing flexibility, collaboration and cooperation or it can be 'diverse', i.e. variable, and unpredictable (Richardson & Pugh, 1981). The SISP literature revealed that SISP is a complex system and cannot be considered as a 'closed' system as it significantly interacts with its external environment.

2.4.2 Definition of Information

Information by itself is defined as 'a difference that makes a difference' (Bateson, 1979 as cited by Salthe, 2001). Information as non-equilibrium opposition (Salthe, 2001) and information as carrying potential to surprise (Dretske, 1981) implicates change: quantitative and qualitative. Two kinds of information are identified: enformation - information about a system itself (information which characterises it as a system) and intropy – information acquired as a result of a system's experience in the world (historical information) (Salthe, 2001). The more a system interacts with the world, the more intropy it acquires. Acquired information causes change in the system as it will try to reduce uncertainty (the Second Law of Thermodynamics). Intropy will cause the system's evolution and as a result, the system's enformation will undergo change. The natural period of a system's behaviour and its inertia plays an important role in a system's evolution. Informational uncertainty or entropy content (the negative of this quantity is defined as the information content, Saaty and Alexander, 1981) will increase in expanding or growing systems.

In simple terms, this translates to: the more the system finds out about the external environment, the more it disturbs its internal environment (action and reaction) which results in changes in the system (potential growth) that again will cause an external chain of events, ultimately giving rise to increases in the uncertainty that the system may meet later (Salthe, 1990). This reveals cycles that repeat themselves, time after time as shown in Figure 2.1. As a result, integration, co-operation or disintegration occurs. Systems analysts (Salthe, 1990) argue that nothing too big can exist for long because of the law of the nature. Very big systems (i.e. organisations) become too big to exist and disintegration into smaller systems (groups) occurs, and the cycle starts again.

This universal reasoning applies to SISP as well. The more investigations about the external environment (external to SISP system, means internal and external organisational environments) are undertaken, the more reasons are found to change the SISP content. Change in content affects SISP implementation, which in turn provokes changes in the external environment of SISP. As an organisation grows, SISP also grows; when a large company disintegrates into a number of small companies, each company engages with its own SISP.

Information as fixed constraints prevents the system from achieving equilibrium. This implies that a system must have a history (observation in two different time frames) to produce information (the difference between two states). 'Similarity' (absence of difference, pattern of behaviour) observed in different time frames can be very useful for the system's future projections (predictable changes) or for the assessment of matching parts within the systems. This study emphasises the importance of knowing the SISP evolution (history). As shown in Figure 2.1, knowing the past, a certain information pattern can be recognised which can help in 'predicting' the future.

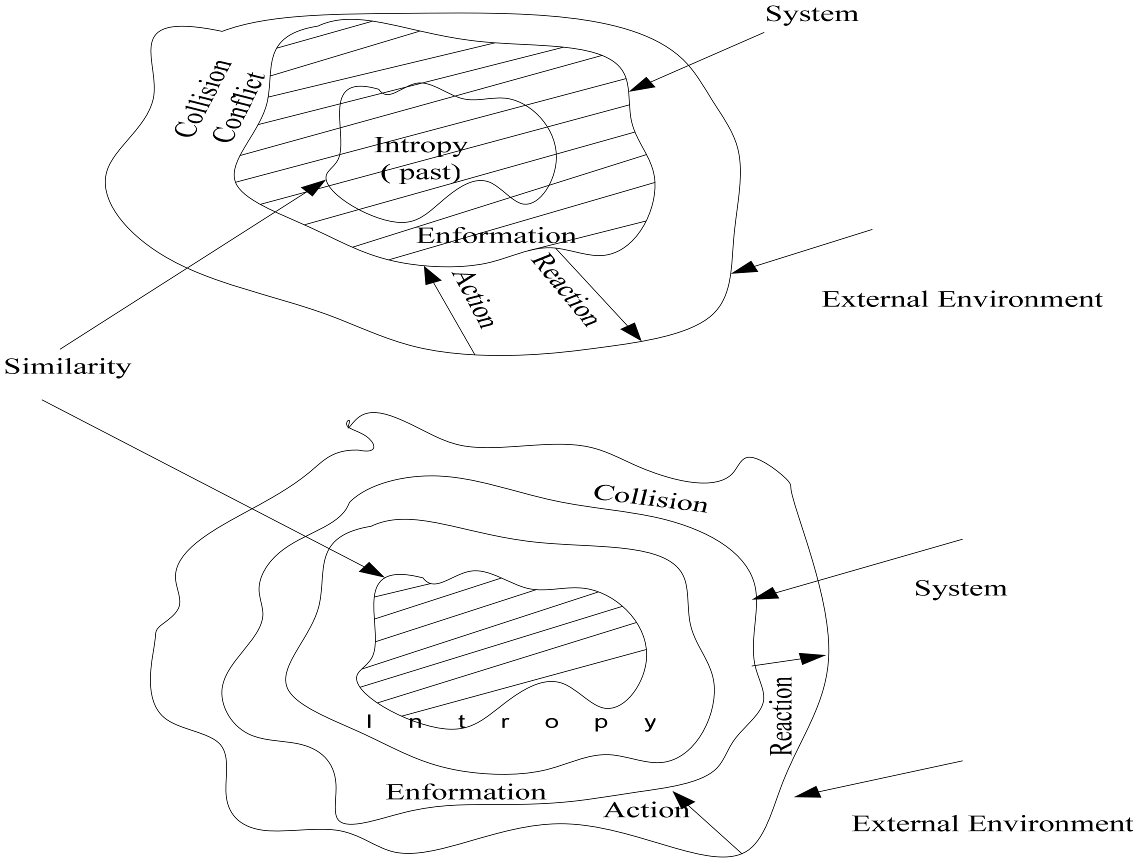


Figure 2.1 Information Systems Growth in Time

2.4.3 Information Systems Definition

Having defined the terms information and system, the study now defines an information system in an organisational environment as a system consisting of personnel and infrastructure for the purpose of generating, storing, processing, and communicating information used within an organisation. It integrates policies, management and control strategies (Wolstenholme, 1994). A plan that is developed, implemented, maintained, and used to explain and guide how an organization can deploy IT elements to work together to efficiently accomplish the mission of the organization today and tomorrow is called a Strategic Information Systems Plan.

2.4.4 Information Feedback

A system also incorporates feedback (Forrester, 1969 as cited by Sterman, 2000). The system feedback loops can be positive (represent growth, 'reinforcing', non self-balancing nature), negative (goal seeking, self-regulating, balancing), or negative feedback loops with time delays (oscillations –damped, limit cycles or chaos). One of the first criteria for defining a system boundary is the closing of feedback loops in the system (Richardson & Pugh, 1981). SISP is considered as a complex process, consisting of positive and negative feedback loops. Negative loops tend to achieve balance (equilibrium); they will counteract any disturbances moving the state of the system away from the goal. In other words, if the system responses deviate from the desired values, the system can be return to balance by taking corrective action. The manipulation of the input variables until the goal is reached can be explicit (under the conscious control of a decision maker), or implicit (unconscious control). The nature of the process largely determines how well it can be achieved. Generally, there are two types of corrective techniques: feedforward (positive) and feedback (negative) control methods.

An organisation is presented as a composition of the systems as shown in Figure 2.2, which naturally forms a negative feedback control loop. This is an overview which positions SISP in its external environment (SISP is not shown; it is a subsystem of Information Systems).

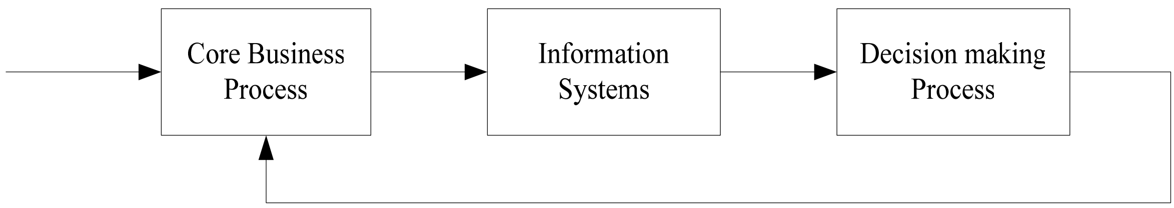


Figure 2.2 Information Systems in an Organisational Setting

2.4.4.1 A System as a Group of Processes

The components of a system can be considered as processes where information conversion (enformation and intropy) occurs (Salthe, 1990). Systems are processes and processes are systems of actions. Action transmits change (transitivity) and carries the asymmetry of time. Systems are made of discontinuous and asymmetric actions, so interactions involve synergy, antagonism, or both. As every action has an opposite (reaction), unequal opposites carry information and produce change. In this context, SISP is analysed through numerous actions needed for its creation and through the reaction its implementation causes.

2.4.5 Feedforward and Feedback Control Loops

Control methods (strategies) are derived heuristically (Tsai, Lane and Lin, 1986). Inductive reasoning from past experience of similar examples, refined through scientific endeavours helps the basic strategy to evolve after an intuitive understanding of the process is acquired. The objective of this research is to seek out principles that could be applied in many instances.

Very often, the external environmental influence on the system cannot be measured (disturbance inputs) and special control techniques need to be used to compensate for uncontrolled disturbances entering the system if the system is to perform desirably.

A feedback control loop is the simplest and most robust control method (Shinskey, 1988). Information of the output deviation from its desired value due to the influence of disturbances on a system is fed back to generate a force that works towards restoring balance. This implies that there must be deviation (an error) hence, it can be said that perfect control is unobtainable with feedback control. On the contrary, the feedforward strategy is based on the state of a disturbance input without reference to the actual system condition. The key variables affecting the process are measured and used to compute the correction to keep the output at the required value. In the ideal case, compensation is applied in such a manner that the effect of the disturbance is never seen in the process output (Tsai, Lane and Lin 1986). But, feedforward control is very difficult to implement; it requires the establishment of a process model and in many instances disturbances cannot be accurately measured or the appropriate action to be taken to compensate for a disturbance is not known (Shinskey, 1988).

It is important to point out that the output variable is not used by the process (otherwise it would constitute a feedback control loop), and that control of the process is possible without the continued measurement of the output. A knowledge of the goal (set point) as part of the control strategy must be known. In addition, it is important to note that the feedforward control system is eventually the model of the process (Shinskey, 1988) which continually maintains the process balance by performing the steady state and dynamic calculations.

If a feedforward control system is to be kept reasonably simple, the process model must be an acceptable approximation of the process, which will reflect back on the quality of the control strategy (Tsai, Lane and Lin 1986). If some of the input components are ill-defined or invariant, or the measurement of disturbances on process outputs have some degree of error, the control system will induce a measurable offset (output deviation from the set goal). If the offset is intolerable, the feedback loop is used to trim the offset (if the controlled variable can be measured with sufficient reliability). A combination of feedforward and feedback control loops applied on SISP (based on Shinskey, 1988) is shown in Figure 2.3 and briefly discussed below.

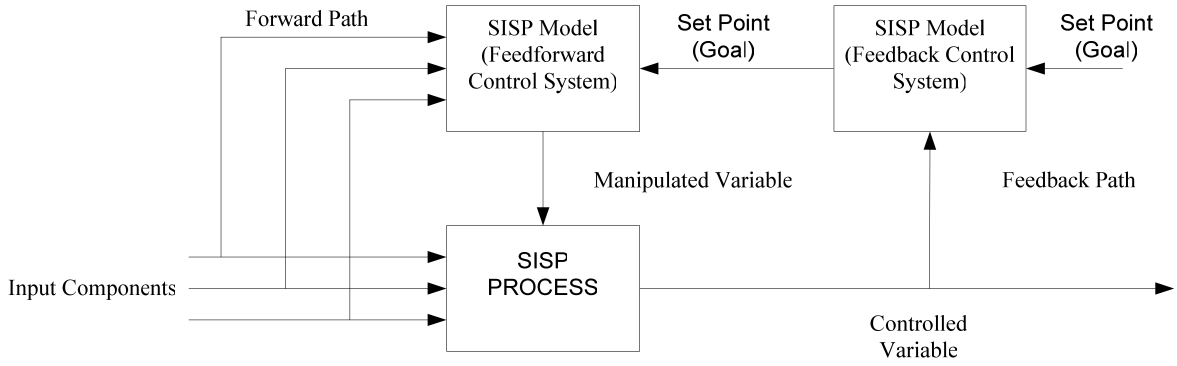


Figure 2.3 SISP: Feedforward and Feedback Control Loops (based on Shinskey, 1988)

If an organization concludes that it has a need for SISP, the process of developing (and implementing) SISP can be monitored and controlled. The starting point is to define a goal (set point). The goal may be a development of a high quality plan (aligned with the business plan, etc) in a certain time frame, with specified resources. Then, a SISP model is adopted where the internal elements are modelled by using existing or creating new methodologies. The inputs shown in Figure 2.3 refer to the external environment, such as business objectives and IT objectives. Also, various regulations, constraints on the availability of qualified resources, and so on, could be inputs to the SISP process. If for example, business objectives are changed, then that change can be captured well before it affects the SISP implementation (feedfoward) or after the change has a measurable (undesirable) effect on implementation. Corrective measures (manipulative variables) in both circumstances could be a request for rework, alternations to the schedule, etc.

Essentially, to model, a feedforward control system as shown in Figure 2.3, a number of different approaches are investigated. Inputs to this model are of a linguistic nature obtained from human experts. The literature review reveals that fuzzy control is an effective approach to utilising linguistic and numerical information (Zardecki, 1996, Pedrycz, 1996). Also, the Analytic Network Process (Saaty, 2001a), with ratio scales, gives us the power to understand problems with dependence and feedback.

2.4.6 IS Subsystems

Information systems are instances of integration of complex relationships among a large number of constructs. The key issue is to identify linear and non-linear relationships only between relevant constructs, reducing the complexity to an acceptable level (Forrester as cited by Richardson & Pugh, 1981, Saaty, 2001b). To understand internal and external forces of an Information System, all of its subsystems must be identified. Figure 2.4 shows the major constituent elements of an Information System. All these constituents influence the SISP subsystem and/or are influenced by the SISP subsystem. They are: Policies, Human Resources, Technology and Applications, and Information Services.

This level of abstraction for Information Systems is supported in the literature (Broadbent et al., 1999). The policy foundation of information systems is one of the most critical issues (Neumann, Ahituv & Zviran, 1992). A complex system must be evaluated in terms of bodies of external and internal standards (King, 1988:105). Policies are seen as SISP outputs defined as 'the general rules that will be used to guide IS development'. 'Multiple system stakeholders' analysis should be applied in information systems contexts. Technology, applications and information services (including all aspects of the design, development, implementation, and operation) are widely acknowledged as inherent dimensions of information systems (King, 1988).

Inputs to the model are business requirements aligned with the goals of IT/IS through a process of communication/negotiation and disturbances are all other external environmental factors which cannot be changed (such as government legislation). The internal environment is presented as action/reaction forces between constituent elements.

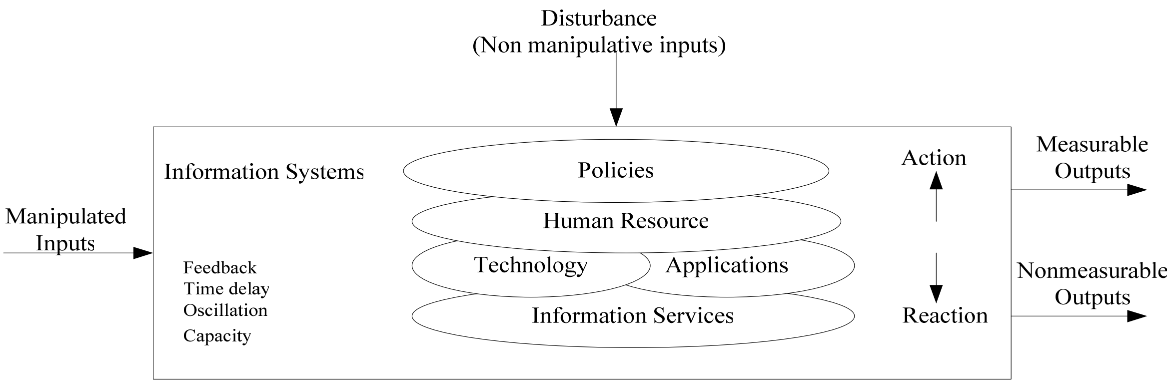


Figure 2.4 Overview of an Information System

Two new terms are introduced in Figure 2.4: time delay and capacity. Time delay (also called dead time, pure delay) is a natural property of the structure of feedback systems. For example if corrective action is applied to a system (negative feedback loop), the time interval during which no response is observable is a time delay. It is very important to know the magnitude of the delay. It can be of the order of seconds, days, months, and even years (for example years may be needed to introduce a new technology/application and to notice adverse effects of the application on the organisation).

Capacity (stock, accumulation) has many forms such as, the order backlog, the stock of inventory, the work force, cash, debt, etc. Capacity is a location where materials, energy or information can be stored. It acts as a buffer between inflowing and outflowing streams, determining how fast content can be changed. Stocks accumulate past events, thus they provide systems memory. The measure of capacity is inertia (Shinskey, 1988; Sterman, 2000; Richardson & Pugh, 1981). For example, knowing the inertia of the system it can be judged how fast SISP can be produced, updated, or an application can be introduced in the system. ‘A lag in information-infrastructure capacity often stymies key dimensions of strategic needs’ (Prahalad & Krishnan, 2002).

Oscillations are one of the three properties fundamental to dynamic systems. For example, the frequency of SISP change reviews will oscillate according to the type of feedback loops. In the case of a big organisational inertia, these oscillations are damped or would appear at limit cycles.

2.4.7 SISP Processes

There are two major processes within SISP: Information Systems Planning and Plan Implementation process. A third process, Evaluation (Figure 2.5), which is the knowledge of how we are doing, is often neglected and is one of the reasons for IS/IT failures (Remenyi and Sherwood-Smith, 1999). If we know what things are going wrong in a timely manner, we can correct them and avoid failures.

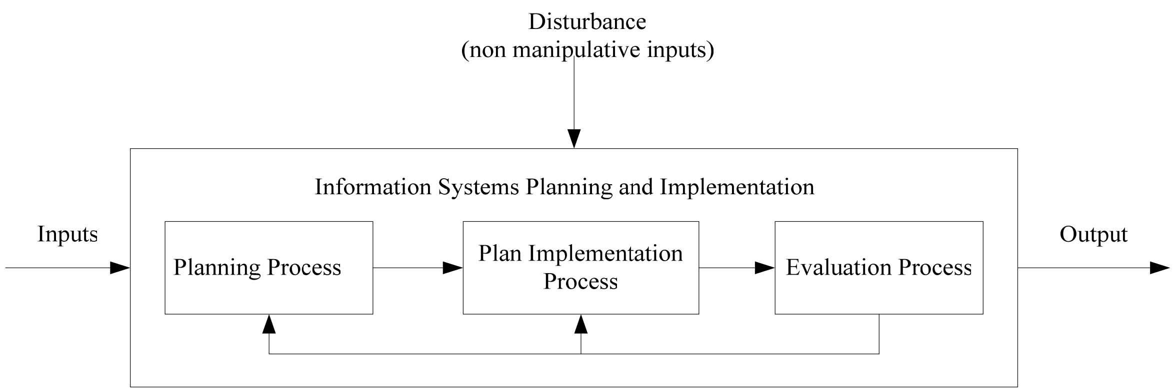


Figure 2.5 Information Systems Planning and Implementation Processes

Although, the focus of this research is Information Systems Planning, it must be stressed that all three processes must be in place and effective to have an overall successful IS function in the organisation.

The Information Systems Planning process can be defined as a process of IS/IT strategy *formulation* and IS/IT planning *formation* (Ward and Peppard, 2002, Ward and Griffiths, 1998). Formation should include two parallel processes: planning and learning (Auer and Reponen, 1997). This research defines the SISP formulation process as a process of analysing external and internal environments for the purpose of positioning IS/IT in relation to the business. Issues and opportunities identified in this assessment should result in generating strategic directions of future IT investments. Various documents are generated during this process, such as documents that describe business needs, current systems, technological trends, issues and opportunities. All these documents are used for supporting the final deliverable of this process, which is a high level document – a SISP overview – for the general direction of IT usage, which highlights the focus and key strategies (McBride, 1998).

A SISP *formation* process is explained through different concepts (Premkumar and King, 1992; Earl, 1993; Byrd, Sambamurthy and Zmud, 1995) and defined as the generation of a plan itself (SISP), which defines all important issues, goals, and related strategies for the deployment of IT across an organisation. The SISP plan, the 'hard' deliverable, is a baseline which has no technical details. Operational plans (prioritized program portfolios) are developed from the SISP plan as shown in Figure 2.6 (based on Ward and Peppard, 2002). The soft deliverables of the SISP formation process are related to factors such as awareness, motivation and alertness.

The programs and projects detailed in the operational plan enable the implementation of the strategies described by SISP. As an application portfolio evolves over time it will cause the SISP strategy to be reconsidered sometime in the future. This research highlights the importance of extending the strategic focus of SISP to a tactical focus (by producing the operational plans) but does not include the operational plans in the content of the research framework.

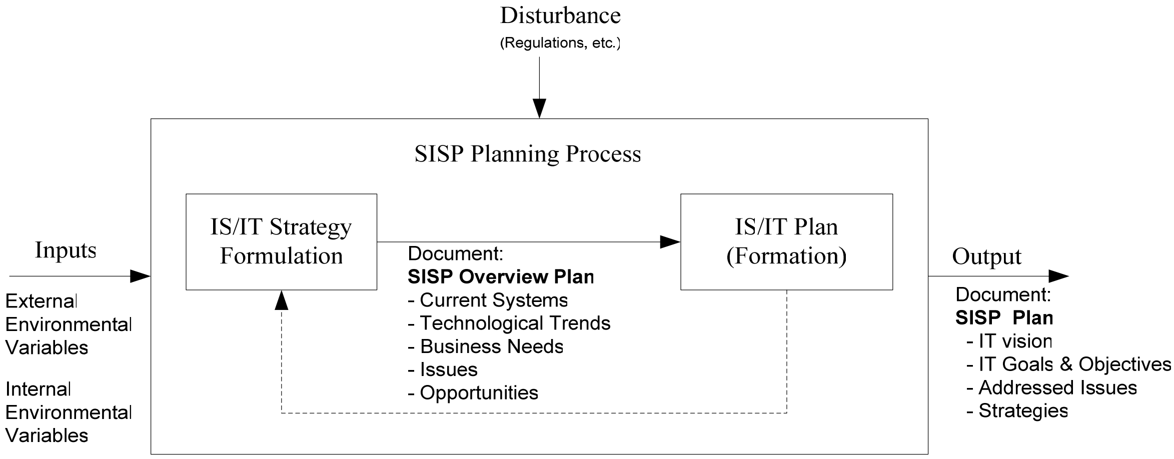


Figure 2.6 SISP Planning Process

The conventional view of a process as 'a set of activities' is a perspective that has been used in the literature to describe SISP planning processes. The SISP planning activities are described as (Flynn and Goleniewska, 1993):

1. Consider organizational goals and strategies and IT aims
2. Assess the current set of information systems
3. Identify information needs of business processes
4. Evaluate the external competitive environment
5. Assess the external technological environment (technological trends)
6. Agree upon system priorities concerning old and new systems and systems under development
7. Provide individual project planning so that each project has clearly identified factors such as timetable, budget and personnel
8. Involve users in the planning process
9. Gain top management support and commitment

Points 1 through 6 are in accordance with the definition of the SISP formulation process. Activities related to the SISP formation process are not recognised; instead, point 7 provides a description of the activity related to production of an Operational plan rather than a Strategic plan.

SISP outputs are components of the plan (Flynn and Goleniewska, 1993), such as:

1. Organizational objectives and activities
2. Information architecture
3. Application portfolio (the set of required applications)

4. Portfolio priorities (prioritized applications)
5. IS management strategy (structure and activities for the IT management function to deliver the benefits promised in the plan)
6. IT strategy (technological infrastructure)
7. Individual project plans

Points 1 and 2 define the deliverables of the SISP formulation process. Other points are a mixture of strategic and tactical SISP plans. In similar way, other studies (Lederer and Salmela, 1996) define the contents of a strategic information plan based on *Method/1* of Andersen Consulting.

Putting the above discussed concepts in an organisational environment, it is unavoidable to deal with the outcome of influences in a complex setting. This research focuses on the role of feedback which is a powerful mechanism for shaping and learning about SISP. Previous sections revealed that systems are defined by their behaviour, structure and evolution. This approach is found suitable for SISP assessment as it gives a structural way of assessing its dimensions. For a better understanding of SISP processes, the study develops a conceptual SISP framework as shown in Figure 2.7.

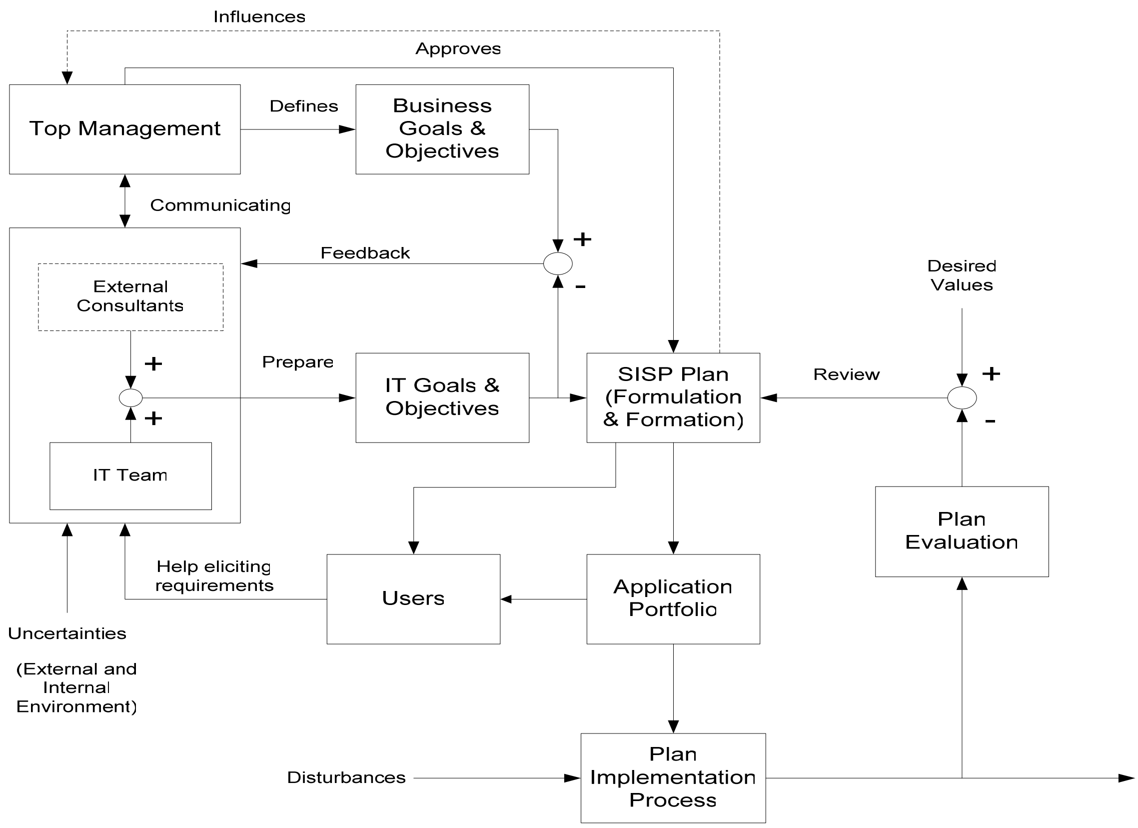


Figure 2.7 An Integral Engineering Framework to SISP

The plus and minus signs are interpreted in the following way. A + and a - means that the two indicated inputs are assessed for the differences, i.e. if the plan implementation differs from the set objectives, the differences are reported to take corrective measures. A + and another + means that the two inputs are combined, i.e. inputs from external consultants (if used) are added to the inputs from the IT team to define IT goals and objectives.

Many studies have recognised that SISP can be modelled (operationalized) as a second-order factor model (Segars and Grover, 1998). In general, a second-order definition gives the criteria for evaluating qualities that are not directly observable (Dooley, 1997; Byrne 2001). Complex adaptive systems theory is applied on business organizations and "… organizations get better at what they already do (first-order change), change what they do (second-order change), and persist or die (third order change)" (Dooley, 1997:89). Following his reasoning, this research, considers SISP as a third-order system. Processing information from internal and external environments is first-order SISP (the SISP structure); the purposeful actions to manipulate observed information to produce better SISP are second-order behaviour constructs; and SISP success is third-order ("survive or die").

2.4.8 Assessment of SISP System Behaviour

It has been suggested that planning activities can be more accurately conceptualised as systems of behaviours, agendas, or process dimensions (Segars et al., 1998; Sabherwal, 1999). The SISP system behaviour is investigated in the light of how SISP reacts to inputs to produces outputs, all for the goal of the success of SISP. The aim of this section is not to define SISP 'inputs' or 'outputs', but to assess how the SISP literature explains the behavioural side of SISP, i.e. the dynamics, and to select behavioural dimensions that are needed for building a SISP assessment model.

SISP theorists and more particularly SISP practitioners have always been concerned about the SISP 'capacity' to efficiently produce and/or update the plan. A lag in information-infrastructure capacity as well as resources capacity is found to be critical for strategic planning (Prahalad and Krishnan, 2002; Basu et al., 2002). Terms such as efficiency and effectiveness are widely used in the SISP literature (King, 1988; Lee and Pai, 2003; Ang, Shaw and Pavri, 1995; Segars et al., 1998; Premkumar and King, 1994) but very rarely used to explicitly define distinct dynamic characteristics of SISP. These terms are often investigated from IT department perspectives, as is the case with Earl’s (1989) work.

It is proposed the use of performance, effectiveness, and efficiency as the key evaluating elements. Also, the ‘semantics jungle’ in the definition of these terms is reported. An assessment of Strategic Planning for Information Systems (SPIS) based on nine evaluation elements is suggested (King, 1988):

- Effectiveness of IS planning;
- Relative worth of the IS planning system;
- Role and impact of the IS planning system;
- Performance of the IS plans;
- Relative worth of IS strategy;
- Relative efficiency of the IS planning system;
- Adequacy of IS planning resources; and
- Strategic congruence; and
- Other (as the appropriateness of IS planning goals and the adaptive ability of the IS planning systems).

IS planning effectiveness is defined as assessment of ‘how well the IS planning system has met its goals” (King, 1988:107). The following items are used to measure planning effectiveness: better assessment of technology trends and better system investment decisions, improved communications with top management, better appreciation of role of IS and improved communications with users, better integration of business objectives and plans with IS plans, greater exploitation of IS opportunities for gaining competitive advantage, increased user satisfaction with IS services, better planning and control of human, software, and hardware resources (Premkumar and King, 1994:104).

Evaluation of planning in terms of the specific planning goals is a common omission (King, 1988). It was proposed that the relative worth of SPIS should be assessed against external standards for ‘good planning’ by criteria, IS strengths and weaknesses, comparative advantage and the assessment of the risk in various strategic IS alternatives. The role and impact of SPIS relates to planing outputs as it answers the question of the plan usage. The assessment of performance is seen as the most difficult step. The return on investment (ROI) may not be appropriate but the identification of SPIS programmes that impact on business is practically beneficial (King, 1988).

Other criteria for the assessment of IS strategy are suggested to be external standards such as: Nolans' stages of growth and strategic opportunities (missed 'good' opportunities and bad opportunities that were foregone). The *Relative Efficiency* of SPIS is related to the resources consumption by the planning process and the *Adequacy of IS planning resources* as a lack of resources to produce the quality and quantity of IS planning outputs. *Strategic Congruence* is assessed in terms of the degree of alignment between IS and business strategy. Two additional evaluation criteria are omitted for an overall IS planning evaluation (the appropriateness of IS planning goals and the adaptive ability of the IS planning systems) for reasons of practicality (King, 1988).

A critical analysis of King's (1988) nine assessment elements in the light of SISP behaviour suggest that only Effectiveness and Efficiency are measures of SISP planning process dynamics. All other measures are related to SISP implementation or they are static characteristics of the SISP, which are investigated in the next section.

'Planning Agenda' and planning behaviours are critical for effective SISP (Boynton and Zmud, 1987). The planning behaviours are defined as interaction among organisational 'actors' to carry out planning agenda. Planning agenda is termed as various analyses (market, business, technology, risk and so on), and planning behaviours as processes (iterative, hierarchical). Also these 'behaviours' are described as: multiple time horizons, a focus on action, an organisation IT mission, strategic opportunity, assumptions and prioritize strategic options.

The success of SISP is also investigated in an organisational context and inter-group behaviour based on organisational, behavioural and IS planning disciplines. SISP methods could be expanded to include individual, behavioural, organisational and environmental factors. Also, strategic IS capability can be considered as another behavioural dimension which is affected by the effectiveness of the SISP process. (Lee and Pai, 2003)

The measurement of the effectiveness of the planning process itself is difficult, and the development of tools or criteria is needed. To compensate for the lack of tools for the SISP effectiveness, the measurement of effectiveness of IT department is suggested. (Ang et al., 1995)

Behavioural IS attributes are identified as: Fast Change; Efficiency; Flexibility; and Effectiveness (Allen and Boyton, 1991). The importance of 'flexibility' to SISP success is stressed and defined in terms: IS flexibility and organisational flexibility which is 'the capability to change or react with little penalty in time, effort, cost or performance; and capacity to respond to environmental changes' (Palanisamy, 2005:67). The term manoeuvrability is used as the primary business requirement imposed on SISP function (Boar, 1993). The general definition of manoeuvrability expressed in the context of planning is described as the summation of all the attributes which position the plan to both act and react expeditiously to the dynamics of the environment (Boar, 1993).

The key points of this analysis are that behavioural perspectives of SISP can be expressed in different ways such as efficiency, efficacy, flexibility, adaptability, performance, efficient flexibility (Allan and Boyton, 1991), and manoeuvrability. The behavioural perspective is sometimes reflected 'negatively' in descriptions such as: not delivering SISP on time (missed opportunities), producing 'bad' IS strategies (materialised in development or acquisition of unimportant or inappropriate systems) and not reacting to environmental changes (implementation of 'outdated' systems could be prevented/replaced with more current ones). Positive attributes associated of SISP are: fast deliver, good quality and adaptable planning.

2.4.8.1 Gaps in SISP Behaviour Assessment

The majority of SISP studies are based on a static approach to SISP alone (King, 1988; Lee and Pai, 2003; Ang, Shaw and Pavri, 1995; Segars et al., 1998). This research uses both static and dynamic approaches to SISP assessment, putting an emphasis on dynamic approach. The study proposes the use of three SISP behaviour dimensions, namely *Efficiency*, *Effectiveness*; and *Manoeuvrability* to bridge the gaps in inconsistency in SISP terminology. Also the study nominates these conceptual propositions:

- The three SISP dimensions: *Efficiency*, *Effectiveness*; and *Manoeuvrability* are higher order factors which governess SISP success; and
- These static and dynamic dimensions are assessed simultaneously.

The reasoning behind the decision to use manoeuvrability rather than flexibility or adaptability is grounded in the fact that *manoeuvrability* pronounces the 'Strategic' side of planning as it is reflected in the work of prominent strategists like Mintzberg and Boar. The three higher order dimensions are defined as follows:

- *Effectiveness*. – The overall quality of the SISP plan (the content of the plan which demonstrates the ability to influence business strategy, the ability to plan for information and knowledge management, the ability to balance creativity with structural, formal approach, sustainability of benefits, awareness of opportunities), expressed in various terms from planning agenda (Boynton and Zmud, 1987) to the 'ends' aspect of planning success as the extent of improvements in planning capability and fulfilment of planning objectives (Wang and Tai, 2003; Ramanujam and Venkatraman, 1987; Premkumar and King, 1994)

- *Efficiency*. Measures the ratio of the output to the input of SISP, links content and process. It is not assessed on pure technical ground as the conventional role of efficiency is enhanced with contemporary trends (White, 1999; Powell, 1992; Worthington and Dollery, 2000). The capability of having successful SISP is examined not only through the assessment of resources and the deployment of methods and technology but also through the relationships between coordination, knowledge sharing, learning, commitments and roles.

- *Manoeuvrability*. Measures responses to the rate of change of inputs. It reflects all the dynamic aspects of SISP. It narrows the wide view of manoeuvrability (Boar, 1993) as the prime requirement of competitiveness to the summation of the all dynamic SISP attributes that reflect the current position against the internal and external environment in order to recognise the need to switch to a new scenario or to correct the existing strategy.

2.4.9 Assessment of SISP System Structure

Since SISP success and 'quasi' success (when an organisation is not aware of missed opportunities) is reliant on complex dependencies among technological, business, and socio-political factors, the complex relationships (between the constructs and between the constructs and the external environment) are investigated. Identification of the key factors will govern development of the SISP assessment model. The SISP literature often uses the terms construct, dimension, subdimension, factor or element interchangeably. This study uses a hierarchical organisation of these terms (described in Chapter 4) and in this section they are used as they appear in the literature under investigation.

Different studies focus on different SISP constructs and mainly revolve around SISP success. There are number of factors that are considered critical in regard to contributing to SISP success. These factors comprise the SISP structure.

Table 2.3 summarizes the factors important to SISP success according to Galliers (1991).

Table 2.3 SISP Success Factors. Source: Galliers, (1991)

Rank (Importance)	Success Factors (From IS planner viewpoint)
1	Senior management commitment
2	Senior management involvement
3	Senior and middle management involvement
4	Increased management understanding of IS/IT
5	Assessment/evaluation of SISP
6	SISP supported by IS management function
7	Business plans a basis for SISP
8	SISP outcomes/process debated by management
9	Middle management involvement
10	SISP outcome: priorities applications portfolio

These factors have also been reported by other studies and are representative of a large number of investigations into SISP planning success factors, although the rank of importance may differ. The literature review suggested the following six variables (shown in Table 2.4) as being critical to the development of successful SISP (Ang et al., 1995). The data presented in Table 2.4 are a holistic conceptual framework for MIS planning based on study of three competing firms in the international courier industry.

Table 2.4 SISP Success Factors. Source: Ang et al., (1995)

Rank	Success Factors
1	Alignment between business objectives and SISP
2	Underlining motivation for the initialization for the SISP process
3	Level of the maturity of the firm
4	Methodology used in developing SISP
5	Framework used for setting IT investment priorities
6	Measurement of effectiveness used for the IS department

Also, five 'standards' of successful planning are identified as: (1) implemented systems; (2) development of data architecture; (3) guidelines for development priorities; (4) reengineering; and (5) education/communication(Goodhue et al., 1992, cited by Segars et al., 1998). However, these success criteria only reflect SISP operationalization.

Some of the criteria for the successful SISP planning process (formation and formulation) are defined as: (1) migration; (2) management control; (3) study focus; (4) team member selection criteria; and (5) needs (Hartono et al., 2003:4).

Many items of these success factors are related to the implementation plan and to the action plans (like "the SISP study specified actions needed to implement the proposed architecture"). The 'study focus' and 'needs' factors reflect criteria required for successful SISP formation (examination of technological, environmental, and industry trends) and SISP formulation (alignment with strategic business planning, the future needs of the firm).

Three constructs for successful SISP are identified: method, process and implementation (Ear, 1993). Those constructs are three distinct categories that emerged after summarization and classification of sixty-five different types of disappointments with SISP as a result of Earl's survey of 27 companies. Method referred to the SISP technique, procedure, or methodology. Process referred to the way the SISP process was managed, and implementation referred to the organizational acceptance of proposals from the SISP study.

The experience of organizations in Earl's study indicated that no single factor is likely to lead to universal success in SISP. Instead, successful SISP is more probable when organizations realize that method, process, and implementation are all necessary issue sets to be managed.

Also, these SISP constructs are proposed: external environment, internal environment, planning resources (as independent variables) and planning process, information plan, plan implementation, and alignment (dependent variables) (Lederer and Salmela, 1996). SISP effectiveness is expressed through dimensions such as: alignment, analysis, cooperation, improvement in capabilities, and contribution (Grover and Segars, 2005). Many other researchers addressed SISP effectiveness by assessing fulfilment of SISP objectives (like Ramanujam and Venkatraman, 1987).

It was discovered that information systems have a far reaching effect on social and business issues (Lee and Pai, 2003; Smits and Poe1, 1996; Basu et al., 2002). Effectiveness of SISP is influenced by communication effectiveness, task coordination, and conflict among stakeholders (Lee and Pai, 2003). SISP in practice is assessed through four aspects: environment, process, form and content, and effects (Smits and Poe1, 1996). With the 'Fourth Era' (the term explained later in this Chapter) new dimensions in SISP success have emerged. For example, the importance of knowledge sharing for SISP success has been confirmed (Pai, 2006).

Also, the influence of SISP stakeholders on SISP success (Basu et al., 2002) and SISP and business planning alignment (Teo and King, 1996) is investigated. IS plan quality as an antecedent to system quality and information quality is introduced (Byrd et al., 2006).

The SISP research areas, constructs and variables discussed are summarised in Table 0.1, Appendix A. Several areas of importance emerged from this analysis. SISP approaches, methodologies and tools are the starting point, needed for both, successful SISP and deeper understanding of its constructs. The alignment issue can be considered from two perspectives: SISP content alignment with business plan and managerial alignment.

An investigation of how internal and external environments influence quality of SISP outputs is a very important issue for this study. One of the research questions is related to finding the key reasons for the SISP implementation success/failure in Australian organisations. The study suggests the investigation of SISP failures instead of SISP success. It gives more weight to what has been published in the SISP literature as the literature more frequently reports failure (failure rates were much bigger than the success rates) and corrected failures are considered as 'successes.

2.4.9.1 Approaches to SISP Success

As there is no SISP industry standard, the SISP literature reports the plethora of approaches to SISP, many of which revolve around Earl's (1993) theory. Analysing data from a number of organisations, Earl (1993) found that the organizational approach is superior to all other approaches and it is the most successful approach with the highest rating for the three constituting elements of an approach: method, process and implementation. The Business-Led approach was found to be in the second position while the Technological approach came in third position and Method Driven and Administrative approaches shared the 4th position.

However, whilst the organizational approach may be in general the most effective, there may be circumstances in which other approaches are more appropriate (Doherty et al., 1999; McBride, 1998). Somewhat in contradiction to this general conclusion, Segars et al. (1998) suggested that there is a single approach, the 'rational adaptation', which is the most effective way for applying SISP. This approach embodies the principle of rationality through a high level of comprehensiveness, formalisation, focus, through top-down planning (flow), and adaptation (consistency and participation). The same authors in 2005 re-confirmed their previous findings, stating that the balanced approach that reconciles seemingly contradictory 'rational' and 'adaptive' dimensions of SISP planning is a 'best practice' for which organisations should endeavour.

Despite all theoretical efforts, new approaches to SISP seemed to be well behind both modern business practice and thinking (Earl, 2000; Willcocks, 2000). Studies like Salmela, Lederer, and Reponen (2000) suggested that an informal, incremental (dynamic) approach to SISP could be less adequate in a turbulent environment. This is quite an opposite conclusion to many findings which warned that comprehensive planning can cost too much and take too long in a turbulent environment (Hartono et al., 2300; McBride, 1998). This again implicates that there is no a universal guidelines applicable to all organisations. In other words, a contingency approach (Sullivan, 1985; Boyton and Zmud, 1987; Sutherland and Galliers, 1989; Earl, 1989) is recognised where the planners select the most appropriate approach and tailor it to the specific needs of the organisation.

Similar findings were reported by Flynn and Goleniewska (1993). They compared the five SISP approaches resulting from the SISP studies from 1985 to 1990 by using a framework defined as: philosophy and aims, planning process involved, resulting output, and strategic advantage through IT. The assessed approaches have many common elements and a few differences due to the activities included (such as pre-planning and assessing the external environment), aims (impact or alignment) and ability to adapt themselves to different organisational changes. Also, the more SISP-experienced organisations tend to have less detailed (step-by-step) approaches. Their survey of 18 UK organisations revealed that the majority of firms use in-house rather than recognised SISP approaches and techniques. Actually, the recognised SISP techniques were not well-known to the majority of the surveyed organisations.

Governed by the principle that the success of SIS planning may not depend on a particular approach, the judgement of SISP maturity (explained in Chapter 4) is based on the assessment of the existence of an approach. The use of an approach will influence both, effectiveness and efficiency of SISP planning, through the form and content of the SISP plan. Also, the study will try to find out which approaches are more common in use and will assess their relationship to the SISP success.

The study then proposes the following hypothesis:

H2: The existence of a formal approach to SISP planning will have a favourable effect on the overall success of SISP.

2.4.9.2 SISP-related Methodologies, Techniques, and Tools

One of the major issues on the IS planning agenda is choosing the right planning methodology. Methodologies, supported by a set of tools and techniques comprise an approach. In this section SISP-related methodologies, tools and techniques are discussed, primarily to bring together various approaches into a framework for the overall understanding of SISP processes. This is helpful for understanding how, and to what degree, relationships between components of the processes affect SISP maturity.

Many methodologies for IS planning are available and most of them work in the right situation and at the right time (Sutherland and Galliers, 1989). Methodologies used in SISP are normally highly dependent on the expertise of those doing the planning (Cerpa and Verner, 1998). A well-structured methodology enables the IS team to plan and track its activities, measure planning achievements, define deliverables and outcomes, and accurately estimate project costs throughout the life of the project (Andrews and Stalick, 1994).

A few 'cookbook' methodologies exist, partly because SISP is a relatively new management discipline and partly because SISP is a creative design process that rarely allows for formal methodologies (Andrews and Stalick, 1994). Methodologies could be classified into impact (focusing on influence IS on business), and alignment, that aim to align SISP and business plans (Flynn and Goleniewska, 1993). Also, methodologies could be classified into general and specific methodologies; the latter are specific for different contexts as business, public or educational context.

Table 2.5 lists the popular SISP methodologies that are available on the market. Any of these packaged methodologies will require customization for client's specific requirements. The following is an overview of the most popular methodologies used in SISP.

Table 2.5 Methodologies used for SISP (after Remenyi, 1991:233)

Name of Methodology	Provider
Method/1	Andersen Consulting
Summit S & Summit D	Cooper & Lybrant
Value Chain Analysis	Porter
4Front	Deloitte & Touche
IEW	Ernest & Yong

Name of Methodology	Provider
Critical Success Factors	Index Group
Critical Success Factors	Rockart
Information Engineering	James Martin
Business Systems Planning	IBM
Information Quality Analysis	Vacca
Business Information Analysis &Integration Technique	Carlson
Business Information Characterisation Study	Kerner
SISP	Database Consultants Europe
Strategic Systems Planning	Holland
Ends/Means Analysis	Wetherbe & Davis
Staged Approach	Nolan Norton
Executive Information Planning	IBM
Information Systems Investment Strategy	IBM
Strategic Investment	IBM
Strategic Investment Methodology	IBM
Information Strategic Planning	IBM
Portfolio Management	McFarlan
Strategy Set Transformation	King
Customer Resource Life Cycle	Ives & Learmont
SSADM	LBMS plc
SISP	Price Waterhouse
SISP	Teach Trans Ltd
Information Systems Planning	ICL (UK) Ltd

The common top-down planning flow is a methodology based on Critical Success Factors (CSFs) and starts from top management analysis of the overall business goals (Earl, 1989). The bottom-up approach is based on portfolio analysis as a technique that looks at existing systems, compares them with the current position and determines where the gaps are. The inside-out approach analyses the needs for new systems, equipment, in other words new technologies available on the market, the deployment of which can contribute to the achievement of business objectives. A number of Australian organization have used a few planning methodologies, and still were in the process of choosing the right methodology (Cerpa and Verner, 1998). They reported that considering the organization's culture, size and management style, the best fit for that organization would be the CSF method. However, the use of more than one method is preferred. They used Sullivan's Contingent Theory (1985) and found levels of organization's infusion and diffusion (i.e. IT technology acceptance and distribution) affecting SISP.

The levels of infusion and diffusion (Sullivan, 1985) will dictate which methodology will be more appropriate to use. Systems infusion is described as the degree of IT influence in terms of importance, impact, or significance; and systems diffusion as the degree to which technology has been dispersed throughout the company.

Hagmann and McCahon (1993) studied 300 Kansas small-to-medium firms. They employed the three Information Weapon (IW) model strategies: (1) innovation, (2) information services, and (3) productivity. The results showed that small-to-medium organizations place little emphasis on SISP. The main conclusion was that these firms lacked planning models and methodologies that are customized to their needs and that these organizations need help in becoming more proactive in linking IS planning to their competitive strategy.

Every business environment is unique and needs to develop its own methodology, which can be based on a formal methodology (Lederer and Sethi, 1988). Many organizations, therefore, adopt a specific methodology, such as: Method/1, Information Engineering (IE), Business System Planning (BSP), etc. Methods may be necessary, but they could fail if the process factors such as the lack of line management participation, poor IS-user relationships, inadequate user awareness and education, and low management ownership of the philosophy and practice of SISP receive no attention (Earl, 1993).

The above discussion points that there is no one right SISP related method, tool or technique that will be successful in every organization. The use of methodology, techniques and tools will increase efficiency of SISP planning process, therefore it can be hypothesised that:

H3: As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases.

However, there is a broader aspect to success of SISP usage in organisations beyond methodologies and this relates to the internal organisational environment and those factors which have been found to facilitate failure.

2.4.9.3 SISP Problem Areas: the Internal Environment

> *Success is the consequence of strategy which make the success of execution inescapable and anticlimactic.*
>
> (Boar, 1993)

Over half of SISP plans formulated are never implemented, or fail to achieve their goals and objectives (Flavel and Williams, 1996). If the plan has not been used, that would be a straight indication of its failure (it has been reported that the plans are produced just for bureaucratic reasons, planning for the sake of planning – just a form of fulfilment). In all other instances, it an attempt must be made to implement the plan and then evaluate it, to be able to talk about its failure. Every organization's SISP process is likely to have problems (Cerpa and Verner, 1998). These problems should be recognized and planned for in the early stages of the strategic IS/IT planning.

An overview of the reasons for the SISP failure as seen by different analysts is compiled in Table 2.6.

Table 2.6 SISP Problems

Source	SISP Problems
Willcocks (2000:240)	
	Inappropriate measures
	Budgeting practice conceals full costs
	Understanding human and organizational costs
	Understanding knock-on costs
	Overstating costs
	Neglecting 'intangible' benefits
	Not fully investigating risk
	Failure to devote evaluation time and effort to a major capital
	Failure to take into account time-scale of likely benefits
Cerpa and Verner (1998)	
	Involvement and commitment of senior management
	Linking IS to business goals
	Rapid change of technology
	Lack of review of the IS strategic plans and evaluation of obtained results
Ward and Griffiths (1996:98)*	
	Top management lacked awareness of the impact IS/IT
	A credibility gap between the 'hype' of the IT
	Top management do not view information as a business resource to be managed for long-term benefit
	Top management demand a financial justification for IT investments
	Top managers are action oriented with a short-term focus
	Lack of adequate resources
	Top management lacked involvement and commitment
	Lack of understanding of the internal and external business and IS/IT environments
	Cultural gap
	Lack of appropriate approach, analytical and creative techniques are not tailored to specific needs
	Business demands are not continually reviewed
Ward and Griffiths (1996:99)**	
	Measuring benefits
	Nature of business
	Difficulty in recruiting
	Political conflicts
	Existing IT investment
	User education resources
	Doubts about benefits
	Telecommunications issues
	Middle management attitudes
	Senior management attitudes

Source	SISP Problems
	Technology lagging behind needs
Earl (1993:4)	
	Resource constrains
	Not fully implemented
	Lack of top management
	Length of time involved
	Poor user-IS relationships
	(All concerns grouped into three categories:
	method concerns, implementation, and process concerns)
	The problems of describing business process for transfer to IT-inappropriate automation
Flynn and Goleniewska (1993:306)	
	Success of planning technique dependent on team leader
	Difficulty in securing top management commitment for implementing plan findings
	Planning exercise very long
	Difficulty of convincing management to implement planning technique
Brown (1992:5)	
	Culture gap between IT professionals and business managers
	Evaluation
	Implementation
	Top management lack of involvement in IT strategy
	Costly planning exercise
Lederer and Sethi (1992:25-45)	
	Organization
	Implementation
	Database
	Hardware
	Cost problems
Lederer and Sethi (1992:69-80)	
	Leadership
	Implementation
	Resources problems
Hoffer, Michaele and Caroll (1989:348-356)	
	Organizational
	Commitment/Contractual
	Outcome/expectations
	Expertise/Technical
	Implementation problems

*based on Lederer and Mendelow's survey (1988)

** based on Wilson's (survey) 1989

Lederer and Sethi (1992) compiled an 18-item list of the SISP problems which are shown in Table 2.7.

Table 2.7 SISP Problems. Source: Lederer and Sethi (1992:28)

SISP Problems	Formulation	Implementation
The methodology fails to take into account organizational goals and strategies	crucial	no importance

SISP Problems	Formulation	Implementation
The methodology fails to assess the current information systems applications portfolio	very important	important
The methodology does not sufficiently involve users	some importance	no importance
The methodology makes inappropriate assumptions about organization size	some importance	some importance
SISP output fails to provide a statement of organizational objectives for the IS Department	some importance	important
It is difficult to secure top management commitment for implementing the plan	important	important
The final output document is not very useful	important	important
The methodology fails to take into account issues related to plan implementation	important	important
Implementing the projects and the data architecture identified in the SISP output requires substantial further analysis	no importance	some importance
The methodology requires too much top management involvement	no importance	no importance
The output is not in accordance with the expectations of top management	very important	no importance
SISP output fails to provide priorities for developing specific databases	no importance	crucial
SISP output fails to sufficiently address the need for Data Administration in the organization.	some importance	crucial
SISP output fails to determine an overall data architecture for the organization	important	important
SISP output fails to include an overall organizational hardware plan	crucial	crucial
SISP output fails to include an overall organizational data communications plan.	very important	very important
The planning exercise takes very long	crucial	no importance
The planning exercise is very expensive	crucial	no importance

Lyytinen and Hirschheim (1987) described IS failure classification as a four dimensions framework: Technical, Data, User and Organisational domains. He stated that there is no ‘best’ classification or concept for failure notation and that organisation should adopt a particular concept based on the following criteria:

- How does the concept help to perceive various IS problems?
- How does the concept help to understand factors and reasons that bring about the problematic solution?
- How does the concept help to identify groups of people concerned?

Wilson (1989) surveyed the Times 500 companies and 47 financial services, and devised a list of 11 barriers, ranked in importance from 1 to 11. For the purpose of comparability his findings are re-ranked from ‘not important’ to crucial as presented below (Table 2.8).

Table 2.8 Barriers to Successful IS strategy Source: Wilson, (1989)

SISP Barrier	Formulation	Implementation
Nature of business	Crucial	Crucial
Measuring benefits	Crucial	Very important

SISP Barrier	Formulation	Implementation
Difficulty in recruiting	Very important	Crucial
Political conflicts	Very important	Important
Existing IT investment	Important	Important
User education resources	Important	Very important
Doubts about benefits	Some importance	No importance
Telecommunications issues	Some importance	Some importance
Middle management attitudes	Some importance	Some importance
Senior management attitudes	No importance	Some importance
Technology lagging behind needs	No importance	No importance

It is obvious that there is no standard framework in presenting the SISP barriers, but commonalities can be derived. From that aspect it was found that among all studies, the research conducted in 1998 by Cerpa and Vener has the list of the most commonly reported problems which are assessed by level of importance (Table 2.9).

Table 2.9 General problems affecting SISP Source: Cherpa and Vener, (1998)

SISP problems	Formulation	Implementation
Reporting level of IS department	Crucial	No importance
Inappropriate planning horizons	Very important	No importance
Budget limitations	No importance	No importance
Organizational politics	Crucial	Crucial
IS management is not part of the corporate planning process	Very important	No importance
Relationship of the IS executive with the CEO	Very important	Some importance
Rapid change of technology	Important	Very important
Senior management fails to communicate its objectives in IS terms	No importance	Very important
Senior management luck IS understanding	Some importance	Very important
Lack of commitment from senior management	Important	Important
Lack of senior management involvement	Some importance	Very important
Lack of experienced personnel	Some importance	Important
Lack of education/ training on how to do SISP	Some importance	Some importance
Lack of corporate strategic plan	Some importance	No importance
Lack of awareness of different SISP methodologies	Some importance	No importance
Business objectives are not stable	Some importance	Very important
Business units do not advise corporate management of their objectives	Important	Some importance

The planning process failure factors are also analyzed based on a Singapore-based survey of 92 companies (Yeo, 2002). The from survey results show the top five failure factors as: (1) underestimate of timeline, (2) weak definitions of requirements and scope, (3) inadequate project risk analysis, (4) incorrect assumptions regarding risk analysis, (5) ambiguous business needs and unclear vision. The failures for context driven issues are specified as: (1) lack user involvement, (2) top down management style, (3) poor internal communication, (4) absence of an influential champion and change agent, and (5) reactive and not pro-active in dealing with problems.

This study conducted a comparative analysis of the reported barriers to successful SISP formulation and implementation. The method used to arrive to a summary is shown in Table 2.10 and was: (1) elimination of all 'not important' and 'some importance' problems, (2) sorting problems (crucial, very important and important), (3) analyzing frequency of similar problems, (4) analysing commonality between formulation and implementation problem (5) grouping problems in categories. The top five failure factors from Yeo's (2002) study are rated as crucial. Thus, Table 2.10 is a summary of the key problem areas (not ranked). Ultimately, these areas constitute the SISP structure. They represent the 'internal environment' of SISP.

Table 2.10 The Key SISP Barriers

SISP Problems
Misalignment of SISP and business goals
Lack of management commitment and involvement
Problems with resources (recruiting & education)
Organisational politics and policies
Quality of the plan inadequate
Inappropriate planning horizons
Rapid change of technology
Intercommunication
Inadequate project risk analysis
Measuring benefits

As successful SISP formation and formulation depends on all these areas they are discussed in more details in the following sections. These areas are treated as subdimensions of SISP and at the end of literature review they will be grouped into distinct dimensions.

2.4.9.4 Misalignment of SISP and Business Goals

Business and IS/IT strategies are not in alignment when business objectives are not supported, enabled or stimulated by SISP strategy (Galliers, 1987; Kearns and Lederer, 2000). Even though the importance of linking of SISP with business objectives is widely accepted and ranked as crucial, still the main reason of SISP failure is misalignment of business and IT/IS strategies (Lederer and Sethi, 1992). This problem is a serious constraint, and a very general lesson is that if full attention is not given to this constraint, positive business result achievements can be huge challenges (Powell and Powell, 2004). The IT organizations are a 'business within a business' and the harmonization of the organization with its IT division is important (Macdonald, 1992). This is to make clear that the IT strategy is not simply derived from the business strategy and that the IT strategy (with its organizational structure and processes) is capable of influencing the business strategy.

The awareness of the importance of alignment was gradually developed, staging through the phase of IS/IT application mapping, defining business needs, detailing IS planning and finally integrating business and IS strategies. Thus, initially too much attention was paid to technological, rather than business, management and organizational issues (Galliers, 1991), and recently, a greater proportion of organizations were achieving closer links between IS and business planning (Ward and Griffiths, 1996). Closer links between IS and business planning can be achieved through effective IT governance as IT governance mechanisms are focused on promoting behaviour consistent with the organization's mission, strategy, values, and culture. IT governance is 'specifying the decision rights and accountability framework to encourage desirable behaviour in using IT' and determines who systematically makes and contributes to IT (Weill & Ross, 2004:2). However, IT governance is rarely explicitly reflected in SISP literature. SISP should reflect good IT governance design that allows organisations the alignment of the business strategy to the services provided by the IT department and to deliver superior results on their IT investments.

The effect of alignment for competitive advantage is investigated by Kearns and Lederer, 2000. Their study distinguished the alignment between the IS plan and the business plan and the reciprocal alignment (the business plan alignment with the SISP). The importance of the reciprocal alignment and its positive impact on organisation performance is empirically validated by Teo and King (1996). Also, the strengths of alignment between SISP and the business planning was expressed in general terms as 'no link', 'weak link', 'integrated', to 'partnership' (Galliers, 1987; Teo and King, 1996; Tanaszi, 2002).

Many studies found that greater alignment will lead to improved effectiveness of IS function (Grover and Segars, 2005; Reich and Benbasat, 2003). Teo and Ang (1999) specified and investigated 18 CSFs for IS planning alignment. Also, social aspects (short-term and long-term) of alignment are investigated (Reich and Benbasat, 2003). The social dimension refers to understanding and commitment to the business and IT mission, objectives and plans. Their research model comprised of four factors influencing alignment: shared domain knowledge between business and IT executives, IT implementation success, communication between business and IT executives, and connections between business and IT planning processes. The dynamic dimension of alignment can be explored using a punctuated equilibrium model, involving long periods of relative stability (evolutionary change), interrupted by short periods of quick and extensive (revolutionary) change (Sabherwal, Hirschheim and Goles, 2003).

Alignment levels assessment can be conducted from the plan content perspective using two dimensions: the connection between SISP and business plans; and the strengths of the linkage between the two plans (Galliers, 1987).

It is possible to define three levels of the alignment: awareness, integration and the strategic alignment. The degree of strategic alignment can be measured by three meta-dimensions of IS support towards the business: support for analysis, support for action, and support for planning. The strategic planning alignment was less frequently attempted and the organisations with the most effective IS functions were those that directed their IS resources to support business planning first, then action, and lastly analysis. Chan and Huff (1993).

The lack of an appropriate management vision, both of the organization's strategies and of the role of IT/IS is a barrier to successful alignment. Also, general managers see the task of the building alignment as the technical task which is left to the IT management and consultants (Macdonald, 1992:261). There are still a number of business managers who tend to see 'computers' in purely an operational context (Ward and Griffiths, 1996). The interface between the business community and IT/IS is drastically improved when general management gets a clear picture of what IT/IS really is. Executives must feel comfortable about SISP impact on their business, they must realize that IT/IS information flow is required to drive their key business processes and trading relationships in the market place (Grindley, 1992).

On the other hand, it is also important that IT/IS managers understand that strategic information must be available 'just-in-time' to the business management not only to enhance management's effectiveness and gain competitive advantage but also to buildup mutual trust and interrelations among them to overcome the 'IT discomfort' (Raimond, 1992). It is reported that the 'IT discomfort' and SISP failure (Swift, 1992) are identified when business and IT management fails to create 'partnership' in ownership of SISP.

The study proposes an assessment of the Strategic Alignment as one of the subdimensions of the SISP structure based mainly on constructs defined in studies by Kearns and Lederer (2000) and Galliers (1987). Consequently, it is hypothesised that:

H4: As the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases.

2.4.9.5 Managerial Misalignment

What is not known nor understood cannot be implemented.
Brown (1992)

IT professionals and managers find it difficult to communicate because of the culture gap and the failure to develop a common language (Brown, 1992). Letting IT managers lead the SISP projects is seen as a potential obstacle to successful SISP implementation. The importance of the managerial role of IT managers is not in question, but IT has no ability to address the policy, procedures and organizational issues critical for successful business. Implementation of SISP is not a trivial process and top management can no longer afford not to be involved in the way IT/IS is used and implemented in their organizations (Brown, 1992). Also, successful SISP seems to require users and managers working in partnership with the IS function. This may not only generate relevant application ideas, but it will tend to create ownership of both process and outcomes. 'Partnership' is needed in all stages of SISP (Brown, 1992).

However, IT professionals are the only ones who really understand the IT process analysis and full integration or 'partnership' (Brown, 1992) of IS and business teams is seen as an imperative to avoid the barriers of a managerial misalignment. Thus, the ownership of the SISP project must be clearly communicated, and the strategy itself must be communicated throughout the organization in a level of detail appropriate for each function to ensure wide 'pollination' of the strategy messages (Brown, 1992).

The cost justification for IT applications should be based on business expenses. This approach can be seen as a tactic to improve the likelihood of funding SISP projects (Macdonald, 1992; Brown, 1992). Many senior managers still know too little about IT or how it could affect their business (Brown, 1992). Exposure to successful IT applications and education can help to understanding IT. Considering that this conclusion is drawn from research conducted a decade ago, it is unlikely that a solution to the difficulty lies just in better education of management to the strategic value of information systems.

In the terms of taking responsibilities for setting up the strategic directions, top management involvement is seen as unavoidable (Brown, 1992; Earl, 1989) that organizations need to plan for senior management IT education as part of their total approach to building their capability in IT/IS.

This section reveals an important subdimension of SISP success. Managerial alignment is directly related to the effectiveness of SISP, and as such will be used for the SISP assessment modelling within this research. It is therefore hypothesised that:

H5: If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful.

2.4.9.6 Lack of Management Commitment

The most general lesson to be learned from the more successful SISP cases is that when SISP has management commitment, success is almost guaranteed (Byrd et al,. 2006). Examples are endless; it is nearly impossible to find an IS strategist who did not raise management involvement and commitment to SISP as an issue.

Senior management involvement will lead to efficient SISP (Earl, 1993) and it is not only difficult to convince management to implement SISP, but is also difficult to convince them even to fund the initial SISP study (Lederer and Sethy, 1999). The reason may be that top management may not understand the plan or they are not confident in IT's ability to carry out SISP. It is also suggested that SISP planners should determine tactics to improve the likelihood of funding (Basu et al., 2002).

There is no doubt that recently, higher levels of managerial IT knowledge have positively influenced the extent of IT use, but top managers do not view information as a business resource to be managed for long-term benefit (Ward and Griffiths, 1996). They only appreciate it critically, when they cannot get what they need. As a result, the work is often delegated to 'experts' and thus managers are increasing the risk of losing the control over IT applications. The applications turn out to be independent of the strategic context of the organization as a whole (Macdonald, 1992). Localized justification of investments can produce benefits that are actually counterproductive when overall business goals are considered (Ward and Griffiths, 1996). If control is lost, in particular, if the control of IS/IT investments is left to individuals or departments often striving to achieve incompatible objectives through IS/IT, the outcome can be disastrous (Broadbent and Weill, 1997).

Thus, it is essential that management commits involvement to the initial alignment, the process to be implemented and the obligations and responsibilities for the achieved results. But still the ‘simple’ explanation that the real planning or implementation problems are usually due to a lack of executive commitment cannot be supported either. The quality and extent of management commitment to resultant SISP may be called into question. Extensive organisational commitment and insufficient senior management involvement to SISP can be detrimental and SISP planners should be aware of negative effects of excessive planning (Galliers, 1991; Basu et al., 2002). Therefore it can be hypothesised that:

H6: As senior management commitment towards SISP increases, SISP success increases.

2.4.9.7 The Problem of Culture Gap

The simplistic view that the SISP problems are usually due to a lack of executive commitment cannot be fully supported. It has been reported (Grindley, 1992) that the major constraint on further progress was neither technical nor managerial. Nor was it problem of resources. It was the culture gap existing between IT and business professionals.

One of requirements of successful SISP (Ward and Grifiths, 1996) is to create a culture for the management of IS/IT which reflects the corporate culture. Corporate culture will be a very important factor in determining the success or failure of firms in the next decade. Culture is often used as a term to explain the troubled relationship between the IT professionals and the rest of business (Ward and Peppard, 1996). Even, after 30 years of coexistence, relationships between IT and business are far from being harmonious.

The management task, if an organization is to optimize its operations, is to understand “the main game”, to understand culture. Still, little attempt has been made to explore the cause of the culture gap problems (Ward and Peppard, 1996). Much of the literature is not concerned with issues of understanding the nature of the problem and managing the relationships. The literature deals with the description of the symptoms and consequences as issues of centralization and decentralization of IT resources (McFarlan, McKenny and Pyburn, 1983; McFarlan and McKenny, 1983) and outsourcing/insourcing (Bettis, Bradley and Hamel, 1992; Galliers, Leidner and Baker, 1999).

Organizational culture is seen as the shared values and beliefs expressed through the form of rules of behaviour in a group or organization. IT and business are the two different cultural groups (with shared and specific values, sometimes referred to as paradigms). The paradigm is surrounded by a web of 'cultural attributes', composed of 'rational' and 'less rational' components (Ward and Peppard, 1996; Johnson, 1992). The IT paradigm can be pictured as a world of technology, striving for technical excellence, driven by career options. The business paradigm is the business world of the never ending quest for competitive excellence, or other 'functional' excellence (Ward and Peppard, 1996; Ward and Griffiths, 1996). Certainly SISP cannot work effectively without the support of the people who hold senior positions in organizations, nor can it survive in climates hostile to its practice (Mintzberg, 1994). Thus bridging the cultural gap between the two groups is vital. The literature analysis reveals that there is a need for IT people to change significantly, (Grindley, 1992); Perring, 1992) and a change of attitude in the business to accept a new role of IT is required too (McFarlan, 1984). In other words, reconciliation and new ways of thinking are required on both sides.

Crescenzi, as cited by Ward and Peppard (1996), used the "7S" to analyze why SISP investments (25 out of 30 in an Index Group study) were unsuccessful. He found that the range of characteristics of IT departments and staff behaviour that are appropriate in a reactive, problem solving, job shop environment are quite inadequate when projects require a proactive, change driven approach (i.e. 'strategic'). It follows that the existing value base from which the organizing principles flow, and from which the mission is defined in its particular way, will represent a different mindset from the one needed to succeed in the new reality. Simply put, a cultural change will be necessary (Whiteley, 1995).

SISP is reliant on complex interrelationships between various internal and external factors. Mature SISP should also take in account culture issues as their impact on planning success can be significant. This study then considers the culture gap as one of elements influencing the policies on which SISP is based, and supports a hypothesis that:

H7: As awareness towards cultural issues and other causes of resistance increases, SISP success increases.

2.4.9.8 Problems with Resources

..at the and of the day, there can be no substitute for good quality minds, experience and objectivity, i.e. PEOPLE.

(Swift, 1992)

It is reported that the first among the five most commonly mentioned facts, contributing to SISP dissatisfaction, is resources constraint (Ear, 1993). One of the highest resource ranked problems was related to the acquisition of a good team leader. In practice, recent surveys found few organizations taking a strategic approach to IT/IS sourcing decisions, though many derived economic and other benefits from incremental, low risk, as opposed to high risk 'total' approaches to outsourcing (Lacity and Hirschheim, 1995).

Information has emerged as the new strategic input for competitive business and estimates are that 75 to 80 percent of the new jobs created will be in the information sector (Helms and Wright, 1992). Yet, the industry will experience a shortage of highly skilled IS/IT resources. The ability to educate/train, deploy and keep highly skilled human resources will be regarded as a strategic business advantage and the means of differentiating a business from its competitors. Whether these resources are located centrally, decentralized or dispersed is of secondary importance.

The location of resources is not as important as the 'political' climate they are working in. SISP strategy must be well communicated to establish a less reactive climate. If the organization becomes dominated by events and reactiveness, the result is that individuals or groups will waste their creative energy on internal 'politics', fighting against the legitimate systems of influence and when those systems are weak, against each other (Mintzberg, and Quinn, 1996). When the barriers to a successful IS strategy were assessed by Wilson (1989), political conflict was placed in the fourth position, on a scale 1 to 11. Associated with political conflicts is a phenomenon called the hidden agenda, described in more detail by Collins and McLaughlin (1998).

SISP in all its phases must be carried out by competent staff resources (from management to implementing personnel). When external IT consultants are deployed, particularly where a proprietary methodology is involved, they 'often become the drivers of the SISP exercise and therefore have substantial influence on the recommendations' (Earl, 1993:8). Appropriate top management knowledge of IT and participation in business planning is rated as significant for ensuring their commitments to IT/IS projects and for strategic IT alignment with business (Kearns and Lederer, 2003). Also, importance of experience and knowledge sharing among all involved in

SISP process is acknowledged (Pai, 2006). Pai investigated the relationship between knowledge sharing and SISP and found that knowledge sharing behaviour influences the effectiveness of SISP. It is therefore hypothesised that:

H8: A more skilful SISP team produces more successful SISP.

2.4.9.9 Lack of SISP Measurement and Revisions

When implemented, SISP's suggested solutions need to be monitored and the success or failure should be reported (Leigh and Walters, 1998). The well-known paradigm 'measure to be able to control' is not followed in SISP, as the domain of measurement is the biggest single failure reported (Willcocks, 2000). When SISP is implemented, very often unexpected, perhaps unwanted, outcomes may happen (Hubbard et al., 1996). Business goals can change, organizational structure can change, and the technology can change. Some of these changes may have an adverse impact on SISP implementation, and may be minimized, even avoided, if corrective action is taken at the right time. So, monitoring and evaluating outcomes and also discovering what is happening during the entire SISP process is very important. It is reported that SISP evaluation is neglected (Remenyi and Sherwood-Smith, 1999). Regular change reviews and learning reviews will lead to successful SISP (Pai, 2006). Monitoring should focus on revealing problems with SISP formation and implementation, rather than tracking the problems' symptoms. Otherwise, only the symptoms are being treated while the causes remain (Loney, 1998). Measurement of SISP performance in financial terms is not recommended because of the complexity to isolate the effect of SISP on the financial performance of an organisation (King, 1988).

Current metrics are lacking in practicality, there is either too much measurement, which maps to wasted resources for collection of data which is hard to filter into useful information; or too little measurement which is mapped into scenarios, where the business operates as 'the confused company' due to lack of clarity of the overall stand and needs of the business (Austin, 1996; Simons, 2000, Wexelblat & Srinivasan, 1999). IS success can be measured by measuring IS plan quality, System quality, Information quality, Usefulness and Use in terms of total organisational cost (Byrd et al., 2006). The importance of alignment is widely recognised and that the inability to measure the precision of the alignment of IT and Business Strategy is a problem (Wilson, 1989; Willcocks, 1992; Griffiths, 1992). Measurement objectives vary, some of them are: improving quality of the future plans (Wexelblat & Srinivasan, 1999), gaining top management support by demonstrating SISP benefits (Gliedman, 2002; Teo & Ang, 2001), improving control of IT/IS project in terms of cost and time (Ward & Peppard, 2002; Willcocks & Lester, 2003).

Then, it can be hypothesised that:

H9: Regular change reviews will positively influence the success of SISP.

H10 The more mature SISP, the more satisfaction is obtained with the accomplishment of SISP measurement objectives

The following section will discuss the impact of the external environment and the factors influencing SISP processes, and will draw attention to the important external barriers related to SISP.

2.4.9.10 SISP Problem Areas: External Environment

Every organization exists in an environment and the environmental influence on the organization's performance is critical. Environmental forces are numerous and interconnected and the level of environmental uncertainty needs to be analysed for purposes like business planning and IS planning. On the aspect of environmental change, the organization sometimes must react with a drastic change to its SISP policy, or at least the SISP plan must be revisited and updated accordingly to minimize adverse effects or to gain advantage. In that connotation, an environmental analysis is worthy of attention as it can help drive the quality of SISP in the right direction or help discover potential barriers that can impact the SISP establishment and implementation. The impact of the level of change in technology, the level of legislative change, the impact of fiscal policy, competitor practices, the challenges of competition in the industry, and social impacts affecting organizations are discussed in this section.

One of the major goals of each planned change effort is to increase the fit between the organization and its environment (Zeira and Avedisian, 1989). The 'external environment' definition is refined by introducing 'general' and 'specific' external environment subdivision (Collins and McLaughlin, 1998). It is referred to a 'specific' environment as a firm's immediate environment, consisting of competitors, suppliers, and customers. Under a more general environment, it is specified social, demographic, economic, and regulatory factors, which tend to have a gradual and indirect impact on a firm (Chi et al., 2005).

'Pressure groups' and 'stakeholders' categories are proposed within the context of the external environment. The external environmental change inputs on organizations was grouped under six principal environmental factor headings: changes in economic structure; sifts in society; political changes; legal trends; ecological trends; pressure groups & stakeholders; emergence of capabilities-based competition; and technological trends (Hubbard et al., 1996; Ward and Griffiths, 1996; Flavel and Williams, 1996).

Tosi and Carroll (1976) introduced and Collins and McLaughlin republished (1998) the 'Environmental uncertainty matrix'. Environmental uncertainty is represented by a two-by-two matrix, describing uncertainty from two perspectives: the degree of complexity (complex and simple) and the degree of change (stable and dynamic). The complex and unpredictable, dynamic environment is characterised by many forces which are in a continuous process of change and there is a high need for in-depth knowledge of these forces.

A four-quadrant presentation of the pace of external environmental change and business as well as the IT/IS responses to this change is provided by Ward and Griffiths (1996). The responses to the change fall in the two categories: tactical (defend, rationalize) and strategic (attack, transform). The 'attack' responses were focused on innovation and competitive advantage and 'transform' action were aimed at radical redesign or dramatic performance improvement. To avoid an ever-present danger of all activities falling in the "Defend" box, IS/IT should be planned to match the pace and magnitude of change demand. Usually it takes up to five years to see changes in business, but recent research indicates that the rapid pace of change could be seen in over just two years (Gome, 2000).

The majority of Australia's organizations have experienced the impact of volatile environmental changes (Hubbard et al., 1996). In Australia, there are numerous cases of organizational death (either through liquidation or takeover) caused by the failure to adapt to changing environments. The State Bank of Victoria and the media empires of Alan Bond are among the most prominent (Hubbard et al., 1996).

The most important factors of the external environmental are: the economy, society, politics, legal, ecology and technology (Ward and Griffiths, 1996). The importance of these factors was seen in relation to their impact on the 'global' business market place and the speed which they are changing. These factors were analysed in terms of potential threats to the quality of the SISP content. SISP is more successful if it is enriched with consideration of all external factors. Less mature SISP planning may consider a limited number of these factors. Thus this study will investigate the importance of the external environment factors for different evolutionary stages of SISP. From the SISP assessment perspective it could be argued that:

H11: The more mature SISP is, the more the impact of external environmental factors is considered.

2.4.9.11 Political Factors

A political system and government policies, laws and regulations that influence the distribution and balance of power across continents, countries, groups, managing succession politics, etc is one of the major issues that needs to be adequately addressed (Hubbard et. al., 1996). The outcomes of political trends in Europe (the Maastricht Treaty) and Asia (Soviet empire political changes, China's influence, Japan's protectionism, etc.), USA (the war on terror) could mean big opportunities or big threats for many Australian industries (Hubbard et al., 1996). The issue of privatisation is not directed at any particular industry, yet it has significant effects in many industries such as airlines, banking, insurance, etc.

Political activity interferes with planning and planning is an apolitical, objective exercise that is undermined by the pursuit of self-interest through confrontation and conflict (Mintzberg, 1994). Planners will design only plans that are politically feasible, and thereby group with some people against others (Van Gunsteren, 1976, as cited by Mintzberg, 1994). Very often, important strategic change in large organizations is initiated by political activity and that political interference on strategic planning can have negative effects (Mintzberg, 1994). The factors cited seem to reflect the views based on the past evolution of IS/IT, rather than its future implications.

There are many barriers affecting an organization's business and the SISP planning process including for example: foreign trade policy, tariffs and protection policies, regulations – like price and standards, investment incentives, trade practice, and research and development grants (Smith, 1994). Hubbard et al. (1996) used exemplars of political interference to British Airways and Qantas plans to pool resources and fix prices on the Australia-London route as these companies wanted to alter their business strategy to be more responsive to the other markets. As SISP should be aligned with business strategy, this would imply SISP changes to allow the airlines to coordinate scheduling, marketing, sales, freight, pricing and other customer service activities.

2.4.9.12 Changes in Economic Structure

All industries are affected by economic parameters (Ward and Griffiths, 1996). Thus organizations that are exposed to the world economy must formulate their SISP strategy in the light of the effects of the relative strengths of different currencies, inflation rates, money market rates, as the product and service profitability is an imperative in business/IS strategy. If investments in infrastructure requirements for SISP implementation are to be considered, the economics of high scale investment are needed to be cost-competitive. Global economic factor may have positive (bring 'good fortune') and negative influences ('misfortune') on business strategy (Boar, 1993:20), which could have a reflection on SISP.

2.4.9.13 Shifts in Society

Social issues are growing in importance, and they are difficult to capture in strategic analysis (Hubbard et al., 1996). The tendency towards change in this area in recent years includes equal opportunity legislation, growth of dual income households, growth of non-traditional households (i.e. singles, single parents, childless), immigration programs, growth in flexible working arrangements, etc. There is a growing awareness of the problems and opportunities facing to organizations by the increasing numbers of retired people. The impact of the aging population will be enormous (Ward and Griffiths, 1996).

A committed strategic response to social issues requires a focus on planned actions (Flavel and Williams, 1996). Failure to meet societal expectations may be detrimental to a business enterprise in the long term (Flavel and Williams, 1996). Social issues can impact SISP, for example, strategic response to growth in flexible working arrangements could be updating SISP strategy to include deployment of the newest technologies.

2.4.9.14 Legal Trends

Apart from specific legislation, which comes from political influences, trends in the legal system can also play an important role in the definition and implementation of SISP. The following legal issues may influence SISP in some organizations (Ward and Griffiths, 1996; Hubbard et al., 1996; Collins and McLaughlin, 1998): restrictions on e-business, paperless trading issues, computer based fraud issues, introduction of some forms of "Data Protection Acts', changes in awarding damages policy; and patent policy. Similarly to social trends, thus legal trends could also influence business operation, and thus may require changes in SISP strategy.

2.4.9.15 Ecological Trends

With an increasing awareness of the need to protect the ecological environment, it often becomes essential to consider how planned expansion and even continued operation will affect and be perceived to affect the air, weather, traffic, density, and quality of life generally (Mintzberg & Quinn, 1996). In recent years the 'Green' movement has imposed limitations on certain companies, but has also created new business opportunities. Affected organizations are forced to think strategically to turn potential threats into marketing opportunities, which inevitably will have an influence on the formation of SISP.

2.4.9.16 Technological Barriers

Everything a firm does involve technology of some sort (Porter, 1985). The technological environment is the fastest changing environment. If organizations are not capable of coping with the pace of technological change they may disappear, or suffer significant losses. New technologies should be accepted only if the technological change itself lowers cost or enhances differentiation and technological lead is sustainable. If the technology is pioneering, the technological change should bring the first-mover advantages besides those inherent in the technology itself (Porter, 1985). However, there is the special case of 'second-mover advantage', where the first-mover actually incurs a disadvantage by taking all the risks involved in bringing a new product/service and becomes the subject to being overtaken by a well-informed and imaginative second-mover (Clarke, 1994).

If IT comes from an external source, it is available to many companies and can act as an equalizer among competitors. It is an imperative that the organization is at least as fast as its competitors in applying IT (Luftman et al., 1993). Only the fastest responders and better implementers can gain a competitive and strategic advantage.

There are two different approaches to specify the selection of IS technology (Allen and Boynton, 1991):

- the low road (IS technology and its management are distributed throughout the firm, and they are the responsibility of every operating manager from subsidiaries down to plants) and
- the high road (IS technology and its management are centralised).

The assumption that investments in IT are always competitively beneficial has proven wrong in practice (Hamilton, 1994). The difficulties experienced can be seen as a direct consequence of earlier IS/IT decision-making which now seems mistaken, yet was presumably in accordance with the perceived wisdom of the day. Given the dynamic and evolving nature of the IT industry there is every likelihood that decisions made now will embed assumptions and conclusions which will equally prove to be wrong in retrospect (Hamilton, 1994).

The following framework can be useful when identifying the potential obstacles associated with the technology deployment. The list describes the major steps which if skipped, can put the organization at a disadvantage (Ward and Griffiths, 1996; Collins and McLaughlin, 1998; Baets and Galliers, 1998)

- Review of the level of use of technology within the enterprise itself;
- Compile a catalogue of all the hardware and software within the enterprise;
- Determine the desired level of technology;
- Discuss the necessity for the in-house development and/or;
- Analyse the need to acquire the new technology;
- Determine the availability of technology;
- Define the alignment with business strategy and Competitive advantage of investment in IT;
- Ensure the confidentiality of strategic IT thinking;
- Avoid simplistic rules to calculate IT expense levels; and
- Identify the potential hazards as a shift in balance of power between companies, vulnerability, and sourcing inflexibility are carefully examined.

SISP planners must be interested in new technologies not to solve an instance of a problem by technology, rather they should be interested in long-term positioning for leverage (Boar, 1993). New technology sweeps away potential advantages and therefore organizations must compete harder for residual advantages (Porter, 1998). On the other hand, a flexible and reusable IT platform have the ability to respond quickly to competitor moves as well as support new process designs or business initiatives in strategic manner (Ward and Peppard, 2002). Thus, technology is both, an enabler and implementer of process change (Galliers, 1991).

Technology can also influence SISP processes making them more efficient. It is empirically confirmed that technology helps planning sophistication (Sabherwal, 1999). Technology is a base that enables better communication across company during SISP preparation, and also it enables data analysis, scenario planning and facilitates monitoring of SISP implementation (Broadbent et al., 1999). There are other views on the role of IT within SISP context. More mature information technology/infrastructure will produce higher quality IT plans (Byrd et al., 1995).

2.4.9.17 Pressure Groups and Stakeholders

In general pressure groups and stakeholders are typically: clients, customers, employees, unions, public, competitors, suppliers, and government (Ward and Griffiths, 1996). ‘Stakeholders’ as a term has been in use from the 60s, and since then has evolved in numerous concepts and approaches through theoretical and empirical studies. SISP stakeholders are categorised into three managerial groups: top management, user and IS/IT management group (Ruohonen, 1991). Relationships of SISP stakeholders and SISP are investigated through organizational commitment, senior management involvement and team involvement (Basu et al., 2002). It is widely reported that the lack of management commitment to SISP is one of main reasons for SISP failure (Cerpa and Verner, 1998; Earl, 1993; Lederer and Sethi, 1992).

A participative SISP is promoted and recognised as a mechanism for generating innovative and creative strategies (Ismail and Winder, 1996). Involvement and commitment of the ‘power stakeholders’ is certainly important but may not be enough if there are no right motivations of all stakeholders involved in the SISP process. Democratic empowerment of others implies the surrender of power from the top management, which can cause problems in some instances (Mintzberg et al., 1998). The structure of organisations and internal politics play a major role in the distribution and direction of the decision making power (top-down or bottom-up). Nevertheless, if SISP is done in isolation (i.e. a planner records management directions), its implementation is more likely to fail due to resistance to change and no motivation for support due to lack of ownership (Ward and Griffiths, 1996). The plan could lack the quality which other stakeholders may bring in (i.e. real assessment of the 'current' internal environment).

Also it is worthwhile pointing to an impressive study done by Mitchell et al. (1997) who assess many stakeholders' dimensions (such as power, legitimacy, urgency) and introduced a dynamic theory of stakeholders' identification.

This study adopts the position that SISP stakeholders are all 'actors' involved in SISP (management, planners, users). From that perspective, they are the foundation, the main structure of SISP. Their influence on SISP is assessed through their involvement and commitment to produce a successful SISP.

2.4.9.18 Competitive Forces: Suppliers and Customers

SISP strategies should also focus on the firm's immediate competitive environment. If structural analysis of industry is done, changes in the immediate environment can be seen as opportunities for shaping the competitive environment and the taking of advantages rather than seen as threats. A sustainable competitive advantage can be gained if the business and IT strategies ensure that the major constituencies of the company are being served: customers, suppliers, employees, shareholders, and etc. (Hubbard et. al, 1996)

Companies need to be tightly connected with suppliers and customers. For example, the textile industry, already advanced in integration of major constituencies become an electronic market place, in which database and consultants are available on line and speciality terms form instantly to solve the problem of the moment (Malone and Rockart, 1991). Questionnaire approach 'can we use IS/IT to' in regard to suppliers and customers might lead to identification and evaluation of potential risk (barriers to success) factors for the formulation of the SISP (Rackoff, Wiseman & Ullrich, 1985). Thus, the SISP literature acknowledges the importance of analysing the firm's immediate environment. However, external shocks, as mergers or a new legal framework (a general external environment), appear to have an important influence on SISP (Smits and Poel, 1996). To test whether a general or immediate firm's external environment have greater influence on SISP, the following hypothesis is established.

H12: A firm's immediate environmental factors have greater influence on SISP success than general external environmental factors.

2.4.9.19 Failure to Analyse Major Competitors

A superior industry analysis requires a detailed analysis not only of one's own company but also of each of the key competitors. Successful IT managers should know competitors' information technology and strategies, being differentiation, cost, and niche (Ward and Griffiths, 1996; Teo and Choo, 2001). Rackoff et al. (1985) developed 'the theory of strategic thrusts' for identifying SISP opportunities in order to 'strike' at three classes of strategic targets: supplier targets, customer targets and competitor targets.

The reason for analyzing competitors is that SISP planners can avoid the element of surprise. If competitors' strengths and weaknesses can be identified, the company can counter them to its advantage (Flavel and Williams, 1996). SISP planners should consider how major competitors will respond to their strategies, i.e. will the advantage they gained be quickly neutralised by the competitors? Planners should allow contingency strategies (Sullivan, 1985; Boyton and Zmud, 1987) to combat competitor responses.

2.4.9.20 Gaps in SISP Structure Assessment

The literature review in previous sections (related to SISP structure) demonstrates that the plethora of the studies offered a variety of different constructs and different measures for them, which rather reflect randomness than building on prior works. There is no agreed notation for many of the SISP dimensions.

This study analyses, reconciles and organises all dimensions and factors that received widespread discussion, from a holistic view (definitional and process perspective) to fulfil objectives of this study. Thus, this research defines the dimension of SISP structure in simple terms to reflect the meaning they should represent.

Therefore, the study defines SISP structure through the following dimensions:

- Form and Contents (Smits and Poe1, 1996; Segars et al., 1998; Ramanujam and Venkatraman, 1987; Byrd et al., 2006);
- Stakeholders' Designation (Basu et al,. 2002; McBride, 1998; Premkumar and King, 1991; Ruohonen, 1991; Mitchell, Agle, and Wood, 1997; Palanisamy, 2005);

- Collaboration (Teo and King, 1996; Segars et al., 1998; Premkumar and King, 1991; Grover and Segars, 2005; Kearns and Lederer, 2000; Brown, 1992);
- Knowledge Bank (Pai, 2006; Boynton and Zmud, 1987; Reich and Benbasat, 2003);
- Policies (Zani, 1970; Neumann et al., 1992; Smits and Poe1, 1996; Ward and Griffiths, 1998; McBride, 1998);
- Viability (Ramanujam and Venkatraman, 1987; McBride, 1998; Powell and Powell, 2004; Palanisamy, 2005);
- Time Dimension (Boynton and Zmud, 1987; McBride, 1998; Segars et al., 1998; Ramanujam and Venkatraman, 1987; Powell and Powell, 2004; Premkumar and King, 1994; Chi et al., 2005; Lederer and Sethi, 1996);
- Technology (Andersen, 2001; Boynton and Zmud, 1987; Broadbent et al., 1999; Sabherwal, 1999).

All these dimensions are defined in detail in Chapter 4.

The literature review continues with discussion of another SISP system characteristic, its evolution.

2.4.10 Assessment of SISP System Evolution

New approaches to SISP evolution seem to be well behind both modern business practice and thinking (Earl, 2000; Willcocks, 2000). Generally, the stages of SISP maturity are not distinguished from the progress in IS/IT and an organisation's maturity. The literature explores IT stages of growth but the lack of a SISP maturity definition in terms of the evolution of its internal processes is a weakness. There is no segregation between SISP maturity and IS/IT departmental maturity. Understanding IS/IT stages of growth will help define SISP maturity.

One can say that the technological advance in an organisation will ultimately determine the evolution stage of SISP. This intuitive approach is reflected in the 'six-stage of growth' concept by Nolan (1979) and the five stage evolutionary process by Ward and Peppard (2002). Lessons from technology implementation failures proved that this approach is too narrow and that a broader set of organisational and management factors should be considered. The Nolan's six-stage growth model defines four stages of the organisation's maturity: user awareness, data processing (DP) planning and control, DP organisation, and application portfolio, while going through 6 stages of growth: initiation, contagion, control, integration, data administration, and maturity. This model did not hold for a large number of organisations and is no longer in use (Drury, 1983).

Bhabuta (1988) developed a 4 phase strategic plan defined in relation to: strategy formulation, information systems application, value system and manner of IT management practicing. Hirschheim, Earl, Feeny and Lockett (1988) differently built their work on the results from the investigation of a number of British organisations. Their model had three distinct phases: Delivery, Reorientation, and Reorganisation, defined by the IS executive role, management focus, educational needs, CEO posture and leadership function.

The models previously discussed do not describe what is needed to advance through the stages of growth. A well published model of seven 'S's (strategy, structure, systems, staff, style, skills and super-ordinate goals, Pascale and Athos, 1981), compiled a list of the most important activities needed for an organisation to progress through IT stages of growth. Organisations, they argue, can 'move backwards' or 'new' established organisation can 'skip' early stages of IT growth (i.e. employment of experienced management, or lost of the key resource, etc.).

Sutherland and Galliers (1989) extended Nolan's framework, by considering social and business issues. They defined the six stages (enhanced later by associating each stage with the Seven 'S's, Galliers and Sutherland, 2003) as: (1) 'Ad hocracy' and (2) 'Starting the foundations'(there is no coherent relationship with the business), through (3) 'Centralised dictatorship' and (4) 'Democratic dialectic and cooperation', to (5) 'Entrepreneurial opportunity', arriving at a very hard achievable level named (6) 'Integrated harmonious relationships'.

In general terms, stages do not always occur sequentially; very often there is an overlap across the stages (Ward and Griffiths, 1998).

2.4.10.1 The Three-Era Model

The evolution of SISP is approached differently by sorting out research results into 'the three-era model' (Galliers and Somogyi, 1987). During the period 1965-1970 of computerization, the preoccupation was with managing the activities-operations, programming, and data collection etc. It has been suggested (Kriebel, 1968) that in the early writings on SISP, attention was concentrated primarily on improving computer efficiency and matters of computer management generally. SISP was seen as being a matter for the IS function, somewhat isolated from the continuing business of the organization, (Galliers, 1991) and strongly based on a centralized, integrated concept derived from the mainframe origins (Ward and Griffiths, 1996). Models developed at that time (Gibson and Nolan, 1974, Nolan 1979) were based on the hierarchical application portfolio model introduced by Anthony (1965). Models were deficient in guidelines for identifying or explaining strategic information system opportunities and concentrated too much on issues of the day, rather than on future goals or concerns.

Later, when an organization was able to cope with various of types of applications, over an extended life cycle during which the technology could change significantly, the ‘department’ was managed as a coordinated set of resources, which were planned to meet expected future requirements (Ward and Griffiths, 1996). As time passed and experience in IS management was gained, there was growing concern on the part of management to have business driven SISPs, capable of dealing with the business problems or issues they faced. Such approaches, somewhat reactive in nature, gave emphasis to top-down planning (Zachman, 1982; Rockart, 1979).

Table 2.11 shows that from the 1960s to the early 1980s, IS/IT and its deployment in organizations passed through a major transition, which was linked two eras. These two eras are summarized (Ward and Griffiths, 1996) as: data processing from the 1960s onward (DP era) and management information systems from the 1970s onward (MIS era). Researchers agreed that the 1980s were the beginning of what is widely defined as the strategic information systems (SIS) era, which was characterised by use of desktop computing and SISP that promoted delivery of competitive advantage (Ward and Peppard, 2002). In the mid to late 1980s came calls for the adoption of new methods (Sullivan, 1985; Earl, 1988 and 1989; Henderson and Sifonis, 1986) as the IT environment changed in many ways. Furthermore, as computer-based information systems played a more important role in the organization’s business strategies, the links formed between business planning and IT planning tightened. However, IT planning activities remained somewhat reactive with regard to organizational strategic determination processes.

Table 2.11 Trends in the evolution of IS/IT and SISP*

ERA	Technological Perspective	Planning Characteristic
Data Processing (DP)	(50s) The first very expensive computers used to automate clerical work on batch bases (punched cards were used as input media) (60s) The development of centralised multi-programming, time-sharing large mainframe systems Remote from users	Isolated from business Concerned with cost reduction Technology driven
Management Information Systems (MIS)	(70s) Minicomputers; Interconnected systems Software limitation	More tactical Top-down planning User driven
Strategic Information Systems (SIS)	(80s) Micro computers (personal computers) (90s) Networks, Integrated systems, People/vision limitation Available and supportive to users	(80s) More strategic than tactical (90s) Strategic long term planning Concerned with competitiveness and alignment, Business driven
IT Capability	(00s) Intelligent knowledge-based systems; Flexible and reusable IT platform; Effective use process; Fusing business knowledge and IS knowledge; Working in harmony	Multiple approaches and methods; Effective strategic planning; Partnership

* Based on Galliers and Somogyi (1987), Ward and Griffiths, (1998) and Ward and Peppard (2002)

Earl (1989, 1993) studied the maturity of SISP in United-Kingdom-based companies. He identified five main types of approaches and established a theoretical framework cited by various analysts. These five approaches are organized as levels of organisational maturity with respect to IS planning (Ward and Griffiths, 1998):

Stage 1 - Technology Led with the main focus on IS/IT application mapping
Stage 2 - Method Driven with the main focus on defining business needs
Stage 3 - Administrative which is concerned with detailed IS planning
Stage 4 - Business Led which main task was strategic/competitive advantage
Stage 5 - Organisation Led which is concerned with linkage to business strategy

When considering this presentation with regard to the three-decade categorization, stage 1 to 3 belongs to 1960s-1970s, stage 4 to 1980s and stage 5 to the 1990s. Recently Warr (2006) broadly confirmed the work by Earl (1993) and Segars and Grover (1999) but suggested that SISP approaches have evolved (methods driven approach waned in usage) and a new ‘comprehensive’ approach is recognised. Studies assessing whether the information systems planning advantages were sustained, revealed that the 1980s experienced some success in IS/IT implementation, and very often failure as well (Kettinger, Grover and Segars, 1995).

At any point in time IS planning has been influenced by technological advances, but technological change is not important for its own sake (Porter, 1985). All these years of practice and theory-building worked towards linkage of SISP to business strategy. The technology evolved as a result of an increasing need to link personal computers and workstations to the corporate network and thereby enables information and resource sharing. It is reported that advanced technology has enabled the integration of IS and business strategies (Teo and King, 1996).

2.4.10.2 The Fourth Era Model

The mid and late 1990s are characterised by the use of powerful systems to acquire enormous amounts of data, analyse history and present them for management to be able to 'predict the future'. It is frequently reported that businesses were under sustained pressure and critically dependent on their investment in IT/IS for their success (Ward and Griffiths, 1996). This decade, in particular the late 1990s, was characterized by an IT/IS 'boom', and seen as an open, application integrated, information sharing, and network oriented era. The Internet and globalization have far-reaching effects on the way entrepreneurs think, plan and execute business. They are increasingly using Web technologies to maintain and expand their businesses. Thus, the SIS era has completed the links (alignment) between computer systems and the business strategy (Ward and Peppard, 2002).

All these have led to the consideration of more radical strategies than previously seen. Business re-engineering theory emerged in the 1990s (Hammer and Champy, 1994), and an innovating approach to SISP has become an imperative. Thus, strategic IS planning process must become more flexible, ready for more frequent updates to reinforce the benefit which it can offer as '…success in the past has no implication for success in the future' (Hammer, 1998:104). In that sense, strategic IS/IT planning becomes most critical in meeting short-to medium-term needs (Ward and Griffiths, 1996).

Recently, the five organisational phases of information strategy are introduced as: (1) turbulence, (2) orientation, (3) consolidation, (4) exploitation, and (5) tension. These phases are linked to the external and internal environments as well as to the IS processes (Smits and Poel, 1996).

IS capability is launched as a "Fourth Era' which goes beyond seeking alignment or searching out for competitive opportunities from IS/IT (Ward and Peppard, 2002). The IS capability is expressed as three dimensions: working in harmony, being flexible and reusable IT platform, an effective use process and fusing business knowledge and IS knowledge.

Two important aspects of SISP have been under-emphasized: the planning process and the planning evolution (Grover and Segars, 2005). The rationale for this research is based on the same assumptions, which gives additional credibility to this study by confirming that the research area is current and important.

Grover and Segars (2005) proposed that SISP will adapt over time through redesign of its process dimensions and that redesign will result in more effective SISP. They conducted an empirical evaluation of stages of SISP based on six process dimensions (specified at beginning of this section, Segars et al., 1998) and confirmed the existence of SISP stages. Each SISP stage is characterised by different processes, outcomes and different context. The evolution of these stages is studied in the perspective of SISP as a learning system. They describe the stages as:

Stage1: Preliminary Stage (no formal planning, ad hoc and opportunistic, limited alignment with business, top management little or no involved, need for IT change);

Stage 2: Evolving Stage (formal planning, use of methodologies, top management more involved, more organisational participation in SISP, IT diffusion is higher); and

Stage3: Mature Stage (steady state in which SISP can adapt to change, a highly pervasive and diffused IT, balance between rationality and adaptability, integrated with the business planing).

However, the Grover and Segars study was published after this study prepared the measuring instrument, and piloting and data collection had taken place. Nevertheless, the contribution of their study was used for a comparison of results. Their study did not attempt to synthesize the various measures into one single measure of SISP success or level of maturity. Also their study did not take into account the complex interrelationships among constricts while assessing SISP effectiveness. Other behavioural characteristics, like efficiency and flexibility are not explicitly considered.

2.4.10.3 Gaps in SISP Evolution Assessment

This study acknowledges a lack of agreed concepts and put all efforts to reconcile old and contemporary views on SISP as a plan formulation and a plan formation process. Bhabuta's (1988) model identified the planning evolution as it was seen from that point in time. His model, as well Grover and Segars' work (2005) are a valuable starting point in proposing the SISP stages of maturity to bridge the gap in the literature.

Knowing that even within one large organisation some businesses or functions can be at a different evolution stage or an organisation can consciously adopt different planning approaches for different functions, a simple 'an era' approach cannot hold, and the need for 'a different', holistic definition of SISP maturity stages is required. Also, a lack of concise definition of SISP maturity in contemporary terms needs to be addressed.

The emphasis of this study is to extend previous work in more generalizable form. Thus, based on discussions in the previous section the study proposes the stages of SISP maturity as:

- Rudimentary Planning;
- Ineffectual Planning;
- Attainable Planning;
- Sustainable Planning; and
- Adaptable Planning.

Therefore it can be proposed that:

H13: As SISP evolves towards higher maturity levels, the level of planning success will increase.

Also, organisation theorists (Hagmann & McCahon, 1993; Byrd et al., 1995; McFarlan et al., 1983) clamed that organisational size is related to SISP. This study tests that longstanding believe in form of the following hypothesis:

H14: The larger the organisation, the greater the level of SISP maturity.

2.5 Conclusion

SISP is an activity performed not only in large organisations but it is equally important to small companies. This Chapter provides a review of the prior literature related to the research area including: SISP approaches, internal and external environment factors influencing SISP. The main aim was to provide the background information needed to ground this study of SISP. The literature review has centred on the SISP processes – formulation and plan formation. The SISP process is not an 'isolated activity', and all the factors that influence that 'activity' were considered.

Assessment of SISP as a complex phenomenon requires a structured approach in analysing its subdimensions. The literature review provided the ground for considering SISP as a system, which can be assessed through its behaviour, structure and evolution. SISP behavioural dimension in the literature is discussed in terms of efficiency, effectiveness, flexibility and adaptability and defined mainly in terms of fulfilment of SISP objectives.

The key SISP structural elements were identified as: approaches, methodologies, tools, techniques, alignment between SISP and business planning, managerial alignment and commitment, stakeholders, and technology. These elements define successful SISP and they are analysed from that perspective to simultaneously answer the main research question.

The literature review highlighted significant gaps in the existing research which need to be addressed to resolve the research question. These gaps are:

- A need for a contemporary SISP definition;
- SISP was assessed mainly in a static approach;
- Lack of SISP assessment criteria definition;
- Different approaches to the same constructs reflecting randomness rather than building on prior works;
- Same notation has different meaning in similar studies;
- No attempt to synthetize the various measure into a single measure of SISP success or level of maturity;
- A few SISP studies attempted to assess SISP evolution in terms of the evolution of planning processes alone;
- Pronounced inconsistence in approaches to organisation's stages of growth;
- Lack of models for assessment of SISP maturity;

- Lack of holistic approach to SISP; and
- Behavioural characteristics and relationships for efficiency and flexibility not explicitly assessed.

A summary of the hypotheses formulated in this chapter is shown in Table 2.12.

Table 2.12 Hypotheses Description

Number	Hypotheses Description
H1	As SISP evolves towards higher maturity levels, the level of SISP benefits will increase
H2	The existence of a formal approach to SISP planning will have a favourable effect on the overall success of SISP
H3	As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases.
H4	As the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases.
H5	If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful.
H6	As senior management commitment towards SISP increases, SISP success increases.
H7	As awareness towards cultural issues and other causes of resistance increases, SISP success increases.
H8	A more skilful SISP team produces more successful SISP.
H9	Regular change reviews will positively influence the success of SISP.
H10	The more mature SISP, the more satisfaction is obtained with the accomplishment of SISP measurement objectives.
H11	The more mature SISP is, the more the impact of external environmental factors is considered.
H12	A firm's immediate environmental factors have greater influence on SISP success than general external environmental factors.
H13	As SISP evolves towards higher maturity levels, the level of planning success will increase.
H14	The larger the organisation, the greater the level of SISP maturity

This research will be undertaken using research methodologies, techniques and tools presented in the next chapter.

CHAPTER 3

3 RESEARCH DESIGN and RESEARCH METHODOLOGY

3.1 Introduction

This Chapter deals with the issues relating to the research methodology and research design of the study and argues their justification. Research is about answering research questions in a systematic and organised way (Blaikie, 2003). The "*essence*" of research lies in the scientific method, which helps the researcher to know and understand the research topic, and confirm or disprove prior conceptions (Zikmund, 1997). A research methodology depends of the research domain and philosophical position of the researcher.

The research domain of this study is defined by the question: *How can the maturity level of Strategic Information System Planning be modelled in an organisation?* At the beginning of this Chapter different philosophical concepts are presented. These concepts are discussed from the perspective of the general philosophy of research being the ontological and epistemological positions.

Then, the rationale for adopting a specific concept and paradigm that governs the selection of the approaches for this study is presented. In that context, the research design and adequacy of the criteria for selection of research methods is discussed. This Chapter also discusses the potential constraints of the chosen methods.

The ethical consideration used to guide this research and the appropriate role of the researcher in this study is also provided.

3.2 Conceptual Definitions

A research methodology addresses the question of 'how' the study is conducted and it is normally governed by the research questions (Williamson, 2002). The term methodology is defined from different perspectives. An extended definition of a methodology as 'a critical evaluation of alternative research strategies and methods', where research strategies are defined as 'dealing with the logic of enquiry', and research methods are 'the techniques or procedures used to collect and analyse data' (Blaikie, 2003:8). A research design is an integrated statement of and justification for the more technical decisions involved in planning a research, ideally done before the research starts (Blaikie, 2003:21).

The fundamental concepts that deal with research as process are called epistemology and ontology.

3.2.1 Ontological and Epistemological Conceptions

A research work encompasses a set of ideas, a framework (ontology) that specifies a set of questions (epistemology) which are examined in specific ways (methodology, analysis). A researcher needs to adopt a particular view for each of these phases (Denzin and Lincoln, 2003). Ontology is the branch of philosophy that studies conceptions of reality and the nature of being and existence. Epistemology is the study about how that reality can be known; a concern with what constitutes knowledge and how knowledge is formed (Blaikie, 2003; Williamson, 2002).

Each of these concepts is associated with paradigms. Five paradigms are identified being Positivism (Post-positivism), Critical theory et al., Constructivism (Interpretivism, Hermeneutics), and Participatory (Lincoln and Guba, 2003). The main paradigms, Positivism, and Constructivism are briefly presented below and summarised in Table 3.1.

The Positivist paradigm derives its ontological assumptions from scientific realism. Positivism focuses on observations and the object of enquiry is considered to exist and act independently of scientists and their activity. Objectivist epistemology considers knowledge that is only based on what can be objectively observed and experienced (empiricism). Since Positivism relies on facts which can be measured, the emphasis is on quantitative data collections like experiments and surveys. The type of reasoning is deductive and quality of criteria is based on internal and external validity, reliability and objectivity (Blaikie, 2003; Lincoln and Guba, 2003; Cavana et al., 2001).

On the other hand, Constructivism is mainly associated with qualitative methods of research. The type of reasoning is inductive and the quality of criteria is based on trustworthiness and authenticity. This paradigm has an emphasis on people and their interpretation of an ever-changing world. It is concerned with 'the beliefs, feelings and interpretations of participants'. The relativist ontology focuses on a subjective construction of reality and/or the social construction of reality produced by humans acting together. The interpretivist epistemology considers knowledge that is not exclusive of affective and embodied aspects of human experience (Lincoln and Guba, 2003). The hermeneutic methodology is based on the view that an observation is an interpretative process (Williamson, 2002:31). It must be noted that some researches (Neuman, 2003) use the terms quantitative and qualitative interchangeably with positivism and interpretivism.

While the Positivist paradigm has been dominant in the 20th century, a number of researchers have now argued for the relevance of the Constructivist paradigm. However, researchers are now aware that 'the borders and boundary lines separating paradigms and perspectives have begun to blur' (Denzin and Lincoln, 2003:246).

Each paradigm has its own strengths and weaknesses. The main weakness of positivist research is its failure to deal with the meaning of systems of people (including their beliefs and feelings) and hiding the fact that all researches have subjective involvement with their research (Cavana et al., 2001). Criticisms of interpretivist research are that it is too subjective and focused on local, short-term events.

Table 3.1 presents a summary of the main choices that a researcher may follow in research.

Table 3.1 Research Paradigm (Based on Lincoln and Guba, 2003)

Concepts	**Questions to ask**	**Paradigm**	
		Positivist	**Constructivist**
Ontology	What is the nature of reality?	Realism	Relativism
Epistemology	How do I know the world?	Dualist/objectivist, Findings true	Transactional Subjectivist, (Interpretivist)
Methodology	What are the best means for gaining knowledge about the world	Empirical, Experimental, Verification of hypotheses, Quantitative methods	Hermeneutic/ Dialectical Qualitative methods
Ethics (axiology)	How will I be as a moral person in the world? How shall I be toward these people I am studying?	Extrinsic-tilt toward deception	Intrinsic-moral tilt toward revelation

3.2.2 Ethics

This study adopts the code of ethic for professionals in social science. Ethics as ‘a set of moral principles and the rules of conduct’ (Williamson, 2002:331) are applied through the following codes of conduct: *Informed consent, Deception, Privacy and confidentiality, Accuracy* (Denzin and Lincoln, 2003). All participants are informed about the nature of the study and they voluntarily agreed to participate (the questionnaire cover letter shown in Appendix C, has a note that the survey is voluntary). The study opposes to deception of any kind. Privacy and confidentiality is assured by clear statements about strict confidentiality and that identification is not required. Data collected are handled properly to ensure accuracy and validity.

3.2.3 Choice of Paradigm

The main research question in this study and the research objectives cannot comfortably fit within Positivist or Constructivist paradigms, thus ‘a hybrid’ research paradigm will be applied.

SISP in its complexity, apart from technological issues, reflects social issues related to individual and collective manifestation of the values of the actors involved. A Positivist stance implies that a realist epistemology is based on total objectivity during data gathering. Since the observation of SISP variables cannot be solely based on facts, as it involves ‘values’ such as SISP success, the Positivist stance cannot hold completely. On the other hand, a Constructivist paradigm is too extreme when considering SISP variables only as products of a subjective ‘feelings’ and interpretations of SISP participants. Therefore, a paradigm for this study can be defined as ‘broadly’ positivist.

The adoption of a realism ontology is problematic as well. SISP as ‘the object of enquiry’ cannot be considered to exist and act independently of ‘scientists and their activity’. This study cannot avoid measuring variables through the perceptions of social participants engaged in SISP. SISP is mostly expressed as a collective view but also as a personal view. In the case where the cognition of the knowing observation is shared through common cognitive maps, the need for modification of the realism ontology to an ‘internal realism’ ontology is suggested (Archer, 1988). SISP is a product of the cognition of individuals that at the end of the formation process represents the organisational (collective) view. Consequently, an internal realism ontology of the non-positivist paradigm is found appropriate for this research. Naturally this selection dictates a quantitative approach for capturing and analysing data.

3.3 Research Design

A research design is an action plan for getting from here to there.

(Yin 1989, as cited by Blaikie, 2003)

Cavana et al. (2001) reflects common views on designing social research. This study follows their suggestions to explain the research design in a structured way.

The nature of a study, whether it is exploratory, descriptive or hypothesis testing depends of the research problem that is investigated and the stage of knowledge in relation to the research topic (Cavana et al, 2001).

SISP theory (and practice) has emerged for more than 40 years and is currently in an advanced stage which offers a plethora of studies for SISP comprehension. Consequently this study cannot be characterised as exploratory. However, the absence of a theory which organises different methods and prescriptions to enhance understanding of the antecedents to successful SISP is evident (Lederer and Salmela, 1996). To provide adequate SISP maturity definitions from an organisational perspective and to bring qualitative insights into the relationships of the criteria/subcriteria influencing SISP, a descriptive or explanatory approach is taken. Descriptive studies belong to quantitative (positivist) approach.

The study undertaken has a goal to 'offer a profile' and will 'clarify a sequence of steps or stages' in an attempt to holistically depict SISP in organisational settings. These criteria characterise the study as descriptive according to Cavana et al. (2001) and Neuman (2003).

To address *who*, *what*, *when*, and *where* (Neuman, 2003; Zikmund, 1997) many approaches are considered. Four of them are: Comparative judgement, Normative judgement, Goal-centred judgement, and Improvement judgment (Segars and Grover, 1998).

A preliminary investigation and problem definition stage resulted in the conclusion that the most common approaches may not be enough to effectively address the research problem. Recently, the SISP literature called for a more holistic approach for what might be named as the 'New Age' of strategic planning (Ginsberg, 1997). Thus, this research tries to push the boundaries of research, and look at a holistic, integral approach. In particular, Information Engineering is investigated as a popular method for bridging the gap between business requirements and IS systems. Also, analytic thinking, which combines the deductive (focus on the parts) and the system approach (focus on a system as a whole) is explored. As a result of integrating these approaches, an Integral Engineering approach is defined.

The following sections critically discuss all these approaches.

3.3.1 Comparative Judgement

Comparative analysis compares the attributes of the particular system with other 'similar systems' by asking the typical question "How does our system's performance compare against similar systems that are operating in comparable organisations"? (Segars and Grover, 1998). While this perspective is very intuitive, it can give an invalid conclusion when assessing the level of SISP maturity as the comparison base may be inadequate (under-achieving).

The thesis cannot use this approach as it is in contradiction to the key objective of establishing an 'ideal' benchmark model against which to compare SISP maturity in organisations. However, the study uses comparative judgment in the sense of comparing elements of SISP subdimensions following analytic thinking. In that case the question asked is: Of the two elements or criteria being compared, which one is considered more important and how much more important is it with respect to satisfying the 'ideal 'criteria.

3.3.2 Normative Judgment

The typical question to ask for Normative approach is: "How does our system's performance compare against that of a theoretically ideal system"? (Segars and Grover, 1998). Where the theory is in an advanced stage it is possible to compile the set of 'ideal' standards or criteria, which are independent of the unique planning characteristics of the organizations. This approach has utilised by many SISP researchers (Goodhue, Kirsch, Quillard and Wybo, 1992; Ramanujam and Venkatraman, 1987).

This could be a legitimate approach for this study. Nevertheless, Goodhue et al. (1992) and others pointed out to a narrower focus and set of outcomes that this perspective offers. In addition, this approach doesn't offer easy methods for setting the 'ideal' model. The focus can be extended and therefore the study will use this perspective in combination with other approaches.

3.3.3 Goal-centred Judgement

This approach is the most intuitive and widely used (Ramanujam and Venkatraman, 1987; King, 1988). The question to be raised when this approach is taken is: “To what extent are the multiple objectives (or goals) of planning fulfilled”? Every organisation has its own objectives and goals; however, there are general objectives which all SISP systems are trying to reach. The literature review suggests that this perspective is very useful for developing constructs of SISP success.

Similarly to the normative and comparative judgements, the goal-centred approach does not have an associated methodology for the easy assessment of relations among SISP constructs. In principle it is accepted as the theoretical bases for conceptualising SISP maturity constructs.

3.3.4 Improvement Judgement

A typical question for this approach is: “How has the planning system adapted to changing circumstances”? This approach is utilised to know the ability of an organisation to improve, and evolve over time. Also, it can provide a structural approach for assessing the dynamic side of SISP. By providing a broader focus and more applicable measurement insights on various process dimensions, this approach is used by many researchers like Segars and Grover (1998).

The study acknowledges the benefits offered by the improvement judgement and combines this approach with the Analytic thinking approach (described in the next section) to achieve the research objectives.

3.3.5 Analytic Thinking Approach

It is a time to revitalise strategic planning by using complex system modelling and simulation methods (Ginsberg, 1997). The use of the analytic thinking approach in a SISP study is a contribution to those demands for rejuvenating planning theory and practice. Analytic thinking is a new way to manage judgements. While the SISP literature doesn’t report use of this theory (to researcher’s knowledge), there are numerous examples in social science where it is utilised. Numerous applications by individuals, corporations and governments (from energy, transport planning to planning for higher education) are reported (Saaty, 2001b).

This general theory of measurement is grounded in three principles: (1) the principle of constructing hierarchies, (2) the principle of establishing priorities, and (3) the principle of logical consistency. Analytic thinking reflects the way we naturally behave and think. It is characterised as a process of 'systemic rationality', which combines deductive and inductive (or system) thinking (Saaty, 2001b).

(1) The principle of Structuring Hierarchies provides the benefits of holistic assessment of a problem (the system approach) while studying the simultaneous interaction of its components (the deductive approach). In other words, by breaking down the 'system' into clusters and subdividing these clusters into smaller ones, and so on hierarchically, large amounts of information are integrated into the structure of a problem and form a more complete picture of the whole system. The number of parts used is usually between five and nine.

(2) Relationships can be analysed by taking pairs of similar elements and relating them through their attributes against certain criteria. The goal is to discriminate between both members of a pair of elements by judging the intensity of the preference for one over the other. Then, the synthesis process will measure and rank the impact of these elements on the entire system.

(3) Logical consistency is the ability to establish relationships among objects in such a way that they are coherent. Firstly, the objects are grouped according to homogeneity and relevancy (grapes and marble can be grouped if roundness is criteria and not flavour). Secondly, the intensity of relationships among objects should be organised in a logical way (if sweetness is the criterion and honey is judged to be five times sweeter than sugar, and sugar twice as sweet as molasses, then honey should be taken to be ten times sweeter than molasses; if honey is judged to be only four times sweeter than molasses, then the judgments are inconsistent)

The general question to be answered by making pairwise comparison is: Given a control criterion (subcriterion), a component (element) of the network, and given a pair of components (elements), how much more does a given member of the pair influence that component (element) with respect to the control criterion (subcriterion) than the other member?

While analytic thinking incorporates both, qualitative and quantitative properties, it is found that the quantitative approach serves better in many applications. It is both descriptive and normative theory; in the case of pairwise comparisons, it is descriptive, and it is normative by requiring expert judgement to create intensity scales. Analytic thinking is operationalized through the Analytic Network Process (ANP) and Analytic Hierarchy Process (AHP) methods, described later in this Chapter. The study will benefit from the analytic thinking approach as it will enable a reliable way to 'build up' the SISP maturity bench mark.

3.3.6 Engineering Approach

Very recently, SISP started to employ research approaches based on control and systems engineering, fuzzy logic, system dynamics, and organisational cybernetics, to enhance research design and methods (Hevner et al., 2000; Williford and Chang, 1998; Nunamaker and Chen 1990). The engineering attitude to make 'something work' and with emphasis on input, process, and output is recognised as a valid stand in strategic planning (King, 1988; Cecez-Kecmanovic, 1994). An engineering approach also puts emphasis on design to produce results to confirm theoretical prediction. It is utilised for easier communication between business requirements and IS/IT systems. This research in particular investigates the application of 'feedback' and 'feedforward' features of process control engineering (Chapter 2) for the enhancement of SISP processes. The main aim of use of this approach is to enhance the manageability and performance of SISP processes.

3.3.7 Reasons for Adopting an Integral Engineering Approach

As was previously highlighted, the aim of the study is not effectively achievable through commonly used SISP perspectives. There are no enough common standards for assessing strategic planning, thus the sole use of normative judgement will lead to limited outcomes. Also the 'comparative judgement' approach of SISP is calling for comparison of 'similar systems in comparable organisations'. To be able to generalise on a national level, this would be an impossible task for a doctoral study. Some directions from the goal-centred and improvement judgement approach could be utilised, but the lack of supporting methods is the reason to go beyond conventional boundaries of SISP thinking. Consequently, the analytic thinking approach ideally supports the objectives in establishing the SISP benchmark.

The assessment model requires mapping out complex interrelations among model constructs, and the analytic thinking theory is backed up by AHP/ANP methods to support the operationalization of the assessment of SISP maturity in organisations. It also supports conflict resolution in different judgements of importance of SISP constructs. However, attention is drawn to the conscious use of intuitive judgments as well as logic so that the researcher can map out complex interrelations among model constructs (in particular for the measurement model).

A holistic approach in which SISP is defined in engineering terms (input, output, feedback) and where all the factors and criteria affecting SISP are laid out in a network that allows dependency and feedback helps in generating a model. The different relationships between the factors are studied through different hierarchical levels, all belonging to SISP as a whole entity. Thus, SISP is considered as a system consisting of subsystems. Subsystems are further decomposed into components (called clusters as suggested by ANP), and elements (the nodes within an ANP cluster) where the sum of the elements, due to synergy, may not be equal (larger or smaller) to the whole system. This approach fits very well the objectives of developing the theoretical model of the SISP levels of maturity and confirming it through an empirical study. The study names this approach as the 'Integral Engineering' approach. This approach has many similarities with the systems development approach. In fact, the major difference lies in the fact that the systems development approach focuses on the theory testing, building the (prototype) system and observing the use of the system by case studies or field experiments (Williamson, 2002).

The analytic thinking approach for the measurement of tangibles and intangibles was chosen as it allows the comparison of 'apples and oranges' (comparison of their common properties like size, shape, taste, colour, juiciness etc., Saaty, 2001a). ANP, implemented through the Super Decision tool (discussed later in this Chapter) have a sound mathematical theory to support the aggregation of scores for multiple attributes. Most importantly, AHP transforms a multidimensional scaling problem to a uni-dimensional scale.

3.3.8 Research Generalisation

The biggest challenge was to develop a SISP maturity assessment model that was a robust, wide-ranging and yet flexible model for customisation, which fully qualifies each maturity stage of the SISP measurement endeavour. Generalisation was sought to be effective to provide an objective method for the self assessment and benchmarking in terms of the maturity level of strategic IT/IS planning.

All efforts in this research are made to compile constructs upon which the models are based by searching, analysing and cross checking quality publications to give the research the needed confidence. The generally high levels of consistency between different studies are significant because they add credibility to both the sets of findings, and consequently their implications are more likely to be generalisable.

The aim of the research is to achieve the generalisation applicable for the theory and practice of SISP in Australian organisations by selecting an appropriate sample and providing reliable analysis of the results. To demonstrate a confidence in a generalization the study shows that the profiles of companies chosen to study are good representation of the IT arena in the Australian landscape. Also, the study provides an estimate of the error associated with the random sampling.

3.3.9 Hypothesis Study

'A logically conjectured relationship between two or more variables expressed in the form of a testable statement' is termed a hypothesis (Cavana et al., 2001). The following statement of a famous German physicist Werner Heisenberg implies that a hypothesis should be grounded in theory and not in observation.

> 'It is quite wrong to try founding a theory on observable magnitudes alone. In reality the very opposite happens. It is the theory which decides what we can observe'"

Hypothesis testing is as a process of 'explanation of the nature of relationships, or establishment of the difference among groups or the independence of two or more factors in a situation' (Cavana et al., 2001:111). The aim of hypothesis testing is the explanation of the variance in the dependent variable or to predict organisational outcomes. At the end of the literature review, the study aggregates the SISP theory propositions in the form of hypotheses and in Chapter 6 it uses survey data to observe SISP trends and currency in Australians organisations as well as to provide some generalisations based on observed regularities without exploring the cause and effect themselves, i.e. the study uses the proposition type of hypothesis.

3.3.10 Time Horizon of Data Collection

If a research study is based on data collected at one point in time in a single horizontal dimension (over a period of days, weeks or months) it is called a cross-sectional or one-shot study. If data collection is repeated one or more times to address the research objectives, the study is a longitudinal study. Very few SISP studies are longitudinal (Vitalary, 1985). This can be interpreted in two ways; either a longitudinal study is not appropriate or crucial for SISP research or due to the cost and time involved the longitudinal study is avoided. Some researchers (Blaikie, 2003) think that it is useful to follow the change of relationships over time. Strategic studies are about the long term and the researcher believes that longitudinal studies are more desirable. Certainly, the original intention of this study was to collect data at two different points in time, two years apart. The rationale for this was to capture a history, a dynamics of SISP processes. However, the original plan was changed to a one-shot data collection. The literature review did not support the initial belief that the period of two years is long enough to capture a significant change in SISP process (Flynn and Hepburn, 1994; King and Raghunathan, 1987). It would not be a 'real' longitudinal study, it would become nothing more than two cross-sectional studies at different points in time. The reason for this is that the inertia of the SISP system ranges from six months to two years, and to capture the change, it would need a significant period of time, approximately five to ten years (Flynn and Hepburn, 1994; King and Raghunathan, 1987). This doctoral thesis cannot afford such a long research horizon due to the time limit and financial constraints. Thus, the study will capture the present levels of SISP maturity through a cross-sectional study. Still, secondary data can be a source for the past (historical) SISP experiences.

3.3.11 Types of Investigation

The objectives of the study are achieved by clarification (understanding of the concepts of the research topic) and by correlational investigation (assessing and measuring relationships between variables), thus this study follows the path of both, the clarification and correlational investigations.

3.3.12 Extent of Researcher Interference

Most of exploratory and descriptive studies have minimal disruption to the normal work flow such as conducting interviews or administering questionnaire (Cavana et al., 2001). This study will have a diminished impact on the normal flow of work in the surveyed organisations and thus the traditional stance of *detached observer* applies for this study (Blaikie, 2003).

The study extends the view on researcher's interference. The researcher influences on the phenomenon being studied is assessed from the objectivity perspective. The researcher cannot avoid subjectivity because of the need to interpret the observations (prepare measuring instrument, analyse data) in terms of its own vision and experience. Even more, the analytic thinking process involves the integration of hard data with subjective judgments about intangible factors. It is not possible to define the purpose and meaning of reality outside such a framework (Saaty, 2001a). Every attention is drawn to the conscious use of intuitive judgments and logic is confirmed by inconsistency measurement.

3.3.13 Unit of Analysis

Data collection method, sample size and the number of variables depends of the unit of analysis. The research has a primary unit of analysis organisations who have taken some form of SISP in Australia. The objective is to proportionally cover small, medium, and large organisations in public and private sectors in all Australian states.

3.4 Research Plan

Figure 3.1 illustrates the main activities of this research discussed in depth throughout this study. The activities are broadly grouped in four stages. In Stage 1, a preliminary information gathering resulted in a research topic and research scope definition. An overall plan is developed to control and guide the research process. It is decided that the study will be broadly based on the ideals of positivism and such should be of a quantitative nature where data collection is done through a questionnaire survey. Thus, a preliminary measuring instrument is developed and sent to five organisations participating in a pilot survey.

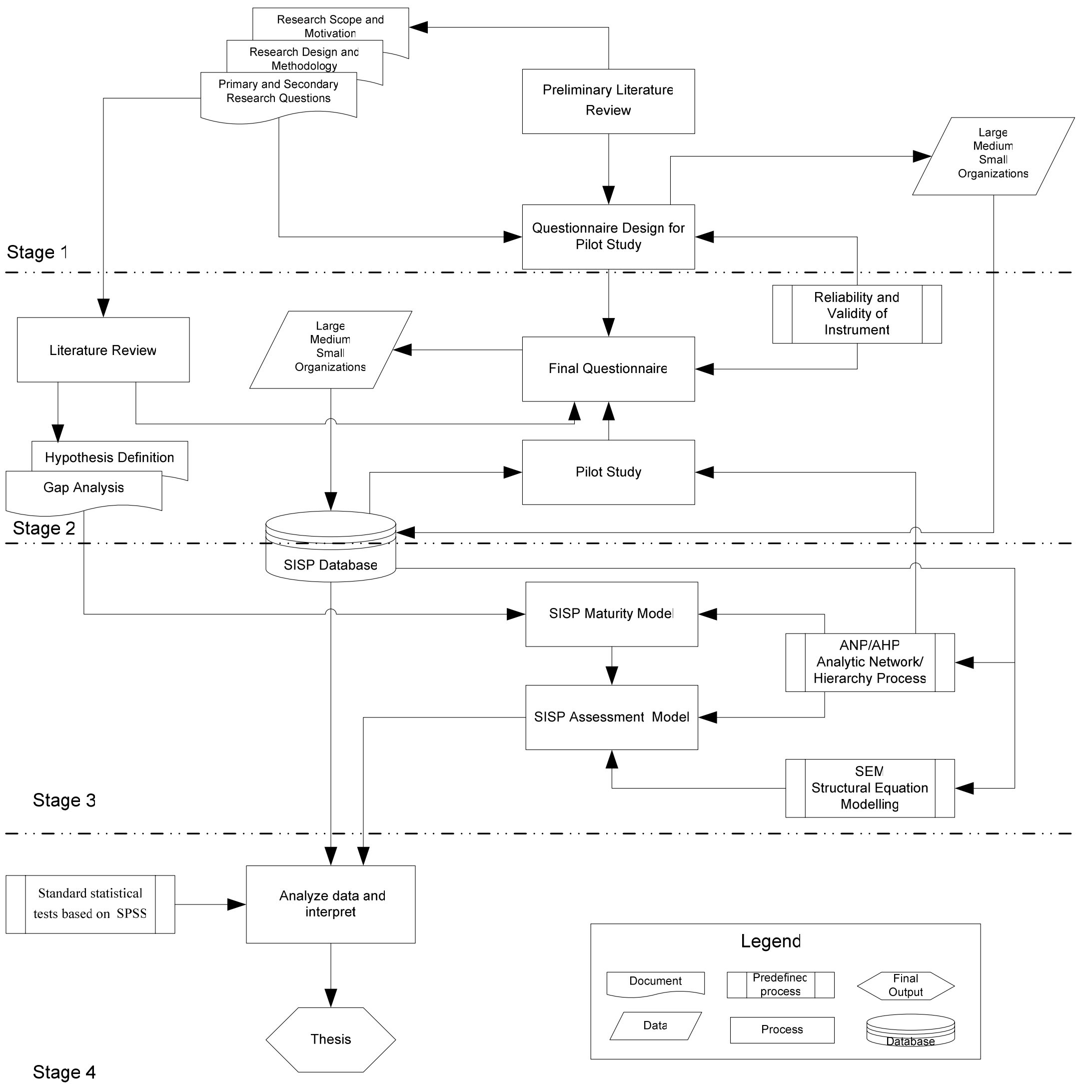


Figure 3.1 Study Research Plan

Stage 2 involved a thorough literature review, pilot study and final questionnaire design. Theoretical Framework and hypotheses are defined and questionnaires are mailed out

In Stage 3, SISP models are developed and Stage 4 involved data analysis and final thesis write-up.

3.5 Research Methodology

The main criteria for selection of a research methodology are: (1) ability of the selection to support the research questions, (2) then how commonly the selection is used in the SISP domain, and (3) the resource constraint of this doctoral thesis.

The study follows the framework of Cavana et al. (2001) to discuss and present the chosen methodologies. They suggested the assessment of: (1) Measurement and Measures, (2) Sampling design and (3) Data collection.

3.5.1 Measurement and Measures

Measurement of the variables (‘hard’ and ‘soft’) is an integral part of this research. The ‘soft’ (intangible) variables, such as SISP success is hard to measure. Soft variables are presented as ‘concepts’. The reduction of an abstract concept so that it can be measured in a tangible way is called operationalising or operationally defining the concept, Cavana et al. (2001).

Operationally defining a concept involves a reduction to its level of abstraction by breaking it into its dimensions and elements. This process doesn’t consist of delineating the reason, antecedents, consequences or correlations of the concept. If the concept is operationalised incorrectly or mixed with other concepts, then it will result in invalid variables (Cavana et al., 2001).

The SISP concept has more than one dimension. The study investigates the three key constructs, being Effectiveness, Efficiency and Manoeuvrability through eight dimensions: Form & Content, Collaboration, Knowledge Bank, Policies, Stakeholders’ Designation, Technology, Time Dimension and Viability. A number of sub-dimensions and elements of subdimensions are identified in Chapter 4 (Table 4.2 to Table 4.9).

3.5.1.1 Measurement Scales

Scales are designed to fit the adopted research design. To source the field data, this research uses four basic types of measurement scale: nominal, ordinal, interval and ratio. The study fundamentally relies on normalized ratio scales, and relative ratio scale (used to avoid use of any kind of units).

The methods of scaling (assigning numbers or description to the scales) are defined as rating and ranking scales. This study uses the most commonly used rating scales, the Likert scale and the dichotomous scale (yes, no fashion question). Although researchers disagree on whether or not Likert scales generate interval level data (Traylor, 1983) this research accept the suggestion (Tull and Hawkins, 1993) that the data from Likert scales can be treated ‘as if they were of equal interval in nature since the results of most standard statistical techniques are not affected greatly by small deviations from the interval requirement’.

In instances where dichotomous scaling is used, but where each answer to the question adds an equal ‘amount’ to the total (additive relationship), the scale is treated as an interval scale. To compare the relative contributions of the observed variables, or to perform some other scale analysis, the standardized coefficients are used to compensate for having different scales for different measures. All scales used for the measuring instrument are shown in Appendix C.

The ratings scale used to judge (define) the stages of SISP maturity is a nine-point scale and is shown in Table 3.2.

Table 3.2 The Fundamental Scale Used for Paired Comparison Judgments, (Saaty, 2001a)

Intensity of Importance	Definition	Explanation
1	**Equal Importance**	Two activities contribute equally to the objective
2	Weak	…… between Equal and Moderate
3	**Moderate importance**	Experience and judgment slightly favour one activity over another
4	Moderate plus	…… between Moderate and Strong
5	**Strong importance**	Experience and judgment strongly favour one activity over another
6	Strong plus	…… between Strong and V. Strong
7	**Very Strong or demonstrated importance**	One activity is favoured very strongly over another; its dominance demonstrated in practice
8	Very, very strong	…… between V. Strong and Extreme
9	**Extreme importance**	The evidence favouring one activity over another is of the highest possible order of affirmation
Reciprocal of above	If activity ***b*** has one of the above nonzero numbers assigned to it when compared with activity ***c***, then ***c*** has the reciprocal value when compared with ***b***	If x is 5 times y, i.e., x=5y, then y=x/5 or y=1/5x
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining ***n*** numerical values to span the matrix

Ranking scales are used for comparison between variables. The most commonly used ranking scales are: Paired comparison, Forced Choice scale, and Comparative scale. The study employs the Paired comparison for ranking which is described in more details in this Chapter where the research tools are discussed.

A single scale can never be sufficient to measure complex variables (Segars and Grover, 1998). SISP is a complex multidimensional construct; hence a spectrum of multi-item scales are needed to measure the SISP attributes. However, the chosen research design rests on a quite different approach in comparison to standard SISP practice, thus, the requirements of scaling somewhat differ, mainly allowing additional flexibility. Choice of scales and scaling for abstract relationship is not of importance for the SISP maturity model. This model is an 'ideal product' where the judgement of priorities is crucial. The number of items and their relevancy to the concept is the foundation for the assessment model.

Items are considered as 'elements' which need to be 'compared' to find out which of two elements is more dominant, or has more influence with respect to a certain element in a level above. Therefore, a scale is considered as a group of items which will be pairwise compared in respect to criteria for different levels of SISP maturity. AHP provides a scale for measuring intangibles and a method for establishing priorities. This scale is a relative ratio scale shown in Table 3.2 which uses the nine points. Experience with this scale (Saaaty, 2001) confirms that nine units (1 through 9) are reasonable to reflect the discrimination of the intensity of the relationships between elements. In this respect, the standard assessment of the scale reliability in terms of Cronbach's alpha coefficient is not necessary.

In addition to the ratings used to judge (define) the five stages of SISP maturity, Appendix C shows the different scales needed for the assessment of SISP maturity. No specific instrument was found to entirely cover the need for SISP assessment, therefore the available scales found in the SISP literature are extended or modified where appropriate. Those scales are used when the SISP maturity of a particular organisation is compared with the 'ideal model'. The connection between the judgement done against the 9 point-scale and scaling shown in Appendix C are done through the concept of absolute measurement (also called rating). This concept is described in more details later in this Chapter.

3.5.1.2 Reliability

The goodness of the measures refers to the examination and confirmation that the research instrument developed or adopted accurately measures the concept it supposes to measure. This process is done through the assessment of reliability and validity of the measures.

The study assesses the reliability of the instrument by estimating how well the items that represent the same research construct yield similar results. This type of reliability is known as internal consistency reliability which is the most frequently assessed by the Cronbach's alpha coefficient. In the literature, the term reliability has different definitions but in broad terms it is defined as the consistency or stability with which the instrument measures the concept. If the scores obtained from the SISP assessment in this study are reliable, then in principle if another researcher carries out the same study in a different sample, he or she should obtain similar results.

The ratio of the true score to the observed score is defined as the reliability of the measurement (Cohen et al, 2003); Pedhazur and Schmelkin, 1991). Reliability assessment is necessary as the observed scores inevitably involve some errors. The observed scores are imperfect due to either random or systematic errors such as random inattentiveness, recording errors, or possible response biases as differential perceptions, etc. A measurement is more reliable if it records mostly a true score, relative to the error. There are varieties of statistical methods which deal with measurement errors, such as meta-analysis (Hunter and Schmidt, 1990), attenuation correction (Cohen et al., 2003), summated multiple item scales and factor analysis.

To increase the reliability of a scale, the practice is to use more than one item to investigate a construct. By adding items to the scale, the reliability is increased because the more complex the theoretical model is, the more the evidence provided about knowledge of the domain investigated. The true score of the component will stay the same when summing across items, but the mean of the error across the items will tend to zero.

When standard statistical methods are used (as a complement to the main research design approach) this 'multi-item' reasoning is followed. But the study balances that requirement with the fact that AHP/ANP considers 'items' as 'single' elements for comparison purposes. The application of relative ratio scales imposes checking of the reliability of the scales through the consistency ratio (C.R) obtained by comparing the consistency index of the matrix of comparisons (C.I) with the appropriate set of numbers as shown in Table 3.3 (Saaty 2001a). In some instances, this research utilises perceptual measures as a single-item scale; similar practice is reported in SISP studies (Sullivan, 1985; Willson, 1989; Groznik and Kovacic, 2000; Ang et al., 1995; Lederer and Sethi, 1992). Single-item scales are appropriate when minimal measurement errors are expected or when constructs are not complex (Conant, Mokwa and Varadarajan, 1990).

Table 3.3 Table of Random Inconsistency for Different Size Matrix (source: Saaty, 2001a)

n	1	2	3	4	5	6	7	8	9	10
Random Consistency Index (R. I.)	0	0	.52	.89	1.11	1.25	1.35	1.40	1.45	1.49

Where ever possible, the scales are adopted from previous research to balance between the new approach and the need to compare results of this study with prior research. These scales have undergone rigorous reliability and validity checking. If the literature review could not confirm that this is the case or the study alters these scales, the standard procedure known as internal consistency is followed as it is described in the next section.

3.5.1.2.1 Internal Consistency of the Measuring Instrument

Internal Consistency is the homogeneity of the items that tap the construct and can be improved by eliminating variables which do not bind together (have a low level of correlation). This type of reliability is defined as equivalence reliability which is applicable when multiple specific measures are used for a construct (Neuman, 2003). Cronbach's alpha, (equivalent to the Kuder-Richardson 20 – ‘KR20’ coefficient), Spilt-half, and Guttman models are among others used for internal consistency assessment.

The study uses Cronbach's alpha coefficient to assess the reliability of the measuring instrument. Cronbach's alpha is developed for psychological and educational measurement where the matrix of a ‘person’ and ‘conditions’ relations are tested. According to Cronbach (2004), this coefficient is appropriate enough for objectively scored tests where items can be considered as a sample from the domain. When judging the suitability of an instrument and the trust that can be placed in observed scores, he suggested that the researcher should be clear on the purpose of the instrument, that is, for the absolute or the comparative measurement? Cronbach (2004) suggests that the standard error of measurement is the most important single piece of information to report regarding an instrument, and not a coefficient. However, in correlational research, it may be easier to specify an acceptable reliability coefficient than a standard error. Also, the use of more advanced techniques such as factor analysis is suggested. The alpha coefficient is now widely used in reliability analyses and the study employs it for a ‘plan’ and ‘conditions’ of the SISP instrument reliability measurement.

Based on the average inter-item correlation, as a measure of internal consistency, Cronbach’s alpha shows how well items measure a single unidimensional latent construct. If items are uncorrelated (a pure error), then the variance of the sum will be the same as the sum of variances of the individual items, i.e. alpha will be zero. If all items measure perfectly the same thing (a pure true score), alpha will be one. By convention, values 0.7 or higher are acceptable to keep a variable in a scale (Nunnally, 1978). However, researchers accept lower values for this coefficient. The study also accepts a cut-off alpha value of 0.6.

During the analysis, one instance was found to be a negative alpha. That prompted for re-testing of all scales by the examination of covariance among variables. A negative average covariance among items was found to be due to coding errors. After re-coding the item, the covariance among items was found to be positive.

In some instances, variables are dropped to improve the alpha level. This is also recorded. In case where a construct consists of a number of uncorrelated components, a lower value of alpha is expected. This was expected as the research instrument was designed to suit the application on ANP/AHP.

Scales were also checked for inter-correlation among their items using principal component factor analysis (PCA). This technique tests if all items of a particular scale measure the same underlying dimension. In some instances, variables of scales load on more than one latent factor indicating that these factors are either subscales of the scale (measuring some related constructs) or the scale has failed to measure what is was set out to measure. Factors with eigenvalues more than 1 were retained. Varimax rotation was then performed and only items with factor loading greater than 0.4 were retained (Byrne, 2001). Each latent factor was checked for Cronbach's alpha. The appropriateness of factor analysis for a scales was checked by the examination of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (cut off point >0.5), factor's 'total variance explained' property and the Bartlett's test of sphericity. Bartlett's test was used to test the null hypothesis that the correlation matrix is an identity matrix, thus variables were uncorrelated. Therefore the observed significance level should be small enough (p<.005) to reject the null hypothesis (Coakes, 2005).

3.5.1.3 Validity

This study discusses validity from two aspects:

- validity of the model as whole (philosophical side of validation); and
- validity of the measuring instrument.

3.5.1.3.1 Validity of the Model as Whole

The question of a model's 'adequacy and completeness', i.e. difficulties in representing reality with a reasonable amount of credibility and proving an assumption's validity, is a major challenge for any model. A very common conclusion (Greenberger et al., 1976 as cited by Ford, 1999) is that useful, illuminating, convincing, or inspiring confidence are more adequate attributes applied to models than being "valid". The building of formal strict mathematical methods for model validation purposes is rather considered as an unnecessary spending of time and efforts as all models are by their nature never true, complete, or adequate representations of reality (Levins, 1966, cited by Ford, 1999).

To some degree, the above view is followed in this study. The chosen technique (described later in this chapter) favours that 'validation' approach. In that sense, Saaty (2001a:xiii) cited the Nobel Prize winner in Economics, Maurice Allias:

> '*We should be very wary of the belief that the scientific validity of a theory can be secured merely by basing it on a strict axiomatization. However much needed, axiomatization is truly only secondary by comparison with the critical analysis of the axioms it is base on and the confrontation of their implications with observed data.'*

Nevertheless, the question of whether a model is competently built must be answered.

The use of the analytic thinking and engineering approaches helps to reconcile the different views while judging the importance of constructs and software tools that support the operationalisation of AHP/ANP theory minimises the need for a model to be subject to criticism and validation because of the 'lack of factors' constraint. It can handle a huge number of interacting factors without being limited by the sample size as is case for the models built with the support of standard statistical methods. These models are seriously limited by the ratio of the number of measured variables and the minimal sample size, and with the data distribution. Therefore, complex SISP models in their entirety are never validated as a 'whole', as large enough, by statistical criteria, sample is practically hard to obtain (i.e. that would require receiving thousands usable surveys form a sampled population). Strict statistical validation (say with structural equation modelling) is conducted only on SISP subdimensions (King, 1988).

In addition, building confidence in a model, basic but essential postulates must be followed. The ancient Greeks were aware that nothing is permanent ('Pante Rhei' -all things flow), thus, basing the model only on a static 'one-shot' of the reality is a way of eliminating the credibility of any model. Incorporating history and dynamics in building an 'Integral Engineering Maturity Framework' brings 'inspiring confidence' to the model.

The question of whether a SISP assessment model was competently built is addressed in two ways. Firstly, extensive efforts were made to compile constructs upon which the model is based by searching, analysing and cross checking good quality publications to give the model the needed confidence. This type of confidence is related to Content validity. Content validity, can be expressed in terms of the extent to which the chosen criteria and other factors represents the SISP domain.

The study cannot not report all ‘behind the scene’ work conducted but it is hoped that it was demonstrated that the development of the theoretical model was based on extensive analysis of available SISP literature as was demonstrated throughout Chapter 2. Also, Korb and Nicholson (2004), while discussing the validation of Bayesian networks (ANP/AHP extends Bayes theory, Saaty, 2001a) suggest that this type of model should be validated against real data, sampled from the real process to be modelled. If the results are according to expectations, the validity of the model is confirmed.

Secondly, strict statistical analysis of a ‘simplified’ SISP model ‘as whole’ was conducted to support the theoretical settings of factors influencing SISP. Also, subdimensions were analysed by means of following strict validation procedures. Those procedures are related to the measuring instrument alone and are described in the following sections.

The validation of ANP/AHP and the tools used in this research is documented in various publications and is not discussed here (Saaty, 2001a; Saaty and Alexander, 1981; Forman & Selly; 2001).

3.5.1.3.2 Validity of the Measuring Instrument

Demonstration of the appropriateness of the interpretations based on the SISP assessment scores will confirm the validity of the measurement scales.

Traditional statistical theory teaches that a scale cannot be valid without being reliable, while a reliable scale can be invalid. It means that reliability is necessary but not a sufficient condition for validity (Pedhazur and Schmelkin, 1991). A modified view of reliability (Moss, 1994) argues the opposite; there can be validity without reliability if reliability is defined as consistency among independent measures.

The study adopts a view which is more common; it will demonstrate that the scales are reliable as well as valid. The methodological literature uses a variety of terms to describe the validity of measurement. The literature calls for the criteria of validity in research to be beyond the ‘face’, ’appearance’, and ‘common sense’. There are three main types of validity: *content*, *criterion*, and *construct* validity. This section concentrates on construct-related validity types, in particular on *convergent* and *discriminant* validity as this is the most commonly used method throughout the SISP literature. Construct validity is demonstrated when a theoretical construct can be inferred from gathered scores. Evidence that the score results are in accordance to our theoretical prediction and understanding of the construct will demonstrate the validity of the construct.

Content and face validity is documented in Chapters 2, 4, and 5. These Chapters, explicitly and implicitly show grounding in prior research. Also the questionnaire was pretested, but having those characterised as the weakest way (and the easiest way) of demonstrating validity (Neuman, 2003) this work explicitly shows that the scales relevant for statistical analysis meet construct validity.

Construct validity is confirmed when it is demonstrated that both the convergent and discriminant validities are achieved (Neuman, 2003).

3.5.1.3.3 Construct Validity

Construct validity is assessed through convergent and discriminant validities. Neither discriminant nor convergent validity alone is enough to confirm construct validity; both are needed to demonstrate construct validity. Convergent validity is achieved if multiple items of the same construct are related to each other, that is, the items are consistent in similar ways. Discriminant validity is demonstrated if it can be shown that theoretically different constructs in reality are not significantly related to each other. It means that the items of one construct diverge or are negatively associated with the opposite construct (Kline, 1998).

Correlation statistics was used to assess the degree of relationships between items (variables). If item loadings on the predicted factors are high (>0.40) it indicates that items of that construct hang together and confirm convergent validity. The opposite, for discriminant validity, the correlation between factors should not be so high (<0.85) (Kline, 1998). Convergent correlations are always higher than the discriminant ones, thus a single analysis can be used to examine both at the same time. The recommended way is to conduct principal factor analysis (also called axising), use an oblique rotation to assess the correlation between factors and compare with indicators loading on the factors (constructs). However, these tests cannot confirm that what was measured was meant to be measured. The relevancy of content domain (face and content validity) is proven by grounding item's definitions on a consistent theoretical work of many researches. The results of validation tests are reported in subsequent sections.

3.5.2 Sampling Design

Sampling is a process of selecting elements from a population so that the selected elements represent the general properties of the population (Blaikie, 2003). The SISP literature shows that the majority of firms do not conduct SISP for reasons such as no budget for SISP, do not believe in benefits of SISP, no IT or IT is outsourced, too small for strategic planning, etc. (Falconer and Hodgett, 1996; Teo et al., 1997). In circumstances of higher diversity (the less homogeneity), the sampling error is greater and random sampling may not represent the population that is of real research interest (Neuman, 2003). In addition, it is difficult to find out the sample size ahead of time by using exact equations as the information about the strength of the relationships among the variables may not be known (Norman and Streiner, 2003).

Similarly, exact scientific sampling techniques in the case of SISP may not be beneficial (.Lederer and Sethi, 1996). To achieve the research goal, to some degree, a combination of simple random and cluster sampling technique was used. Small and medium companies were randomly sampled and the top hundred IT companies were all included to achieve the required degree of accuracy. To determine the required sample size, the study used the procedure for the population proportion described in Lind, Marchal, Wathen (2005) and Blaikie (2003). The formula used to determine the sample size is:

$n = p(1-p)(\frac{z}{E})^2$, where n=sample size, p=population proportion,

z= t value for confidence level, E=sampling error

The study sets the desired level of confidence to 95% and the value of z (the standard normal value corresponding to the desired level of confidence) to 1.96. As the population is not known, the population proportion is set as p=0.5 to be on safe side (the term p(1-p) is maximal when p=0.5). If 0.1 error is allowed in the population proportion, it implies that the population of n is 96 only. Considering the dispersion of the population it was decided to lower the sampling error to 0.02 which required a sample of 2000 firms. In regards to the level of measurement (the use of interval measures requires much smaller sample, Blaikie, 2003) it is possible to have a smaller sample size, but it was decided to use a sample of 2000 as it allowed the response rate to be as low as 4.8% and the sampling error not to exceed 0.1 at 95% level of confidence.

Also, the sample sizes of other SISP studies were compared. It was found that they vary quite a lot and very often the sample size was not been reported. Table 3.4 illustrates a small subset of studies which reported sample size.

Table 3.4 Survey Based SISP Studies

Researcher	Year	Sample size
Galliers	1987	129 UK and 80 Australian organisations
Teo et al.	1997	450 firms in Singapore from which 92 usable survey results were obtained where SISP was undertaken in 58 firms.
Cerpa and Verner	1998	A longitudinal study of SISP is conducted within a large Australian organization
Hamilton and Atchison	1995	Presented a longitudinal case study of IS in Telecom Australia during the period 1960-95
Earl	1993	Investigated SISP activity in 27 different, UK based companies
Flynn and Goleniewska	1993	Surveyed 18 different organization in the UK
Carr and Johansson	1995	Surveyed 46 companies
Hagmann and McCahon.	1993	SISP study is based on a survey of 300 Kansas companies
Lederer and Sethy	1992	Survey of 163 American firms
Wilson	1989	Survey of the Times 500 companies together with 47 financial services companies was carried out to analyse the SISP role

3.5.3 Data Collection

As previously stated, this is a descriptive study and quantitative data collection is necessary. Quantitative data collection falls into two main categories: questionnaires and experimental designs. As this study is of descriptive nature, experimental design methods for data collections were ruled out for this study.

The research design section has demonstrated that the study undertaken is of a descriptive, quantitative nature. This type of study is normally based on questionnaire data collection. The SISP literature review confirms that the most popular methods are questionnaire, case study and interview. For this study, the only viable method is a mail questionnaire as it researches a large sample. Thus, this methodology satisfies all three selection criteria, being able to support the research questions, commonality in use for SISP research, suitability for the resource constraint of this study. This is an efficient method when it is known what is required and how to measure the domain of interest (Sekeran, 2003).

3.5.3.1 Questionnaire Design

A questionnaire (sometimes 'survey' will be used to refer to questionnaire) is an efficient method of collecting data beyond the physical vision of an observer where respondents record their answers on a pre-formulated written set of questions. The efficiency of this method is expressed in requiring minimal resources and normally lower cost relative to other methods. Also, this method allows respondents to have time to consider responses. However, if respondents have queries, this method cannot clarify the question and the response rate is almost always low (Sekaran, 2003).

To address the research questions, it was necessary to distribute questionnaires throughout Australia. The personally-administered option obviously could not be considered; it is applicable only for the surveys limited to a local area.

The most attractive option for this study was e-mail as it offered an easy and a relatively inexpensive coverage of a wide geographical area. A web site was developed and e-mails were sent to a large number of organisations. The response rate was low and it was decided to use the post mail to collect data. It was found that the collection of postal addresses was more reliable and easier task in comparison with finding email addresses.

The response rate was not what was expected. After four weeks, a reminder letter was sent only to the top 100 companies listed in the MIS to increase the response rate. The letter stated the importance of the questionnaire for the research and thanked those who had already responded and reminded others to please respond. The response rate was increased about five percent, and it justified the efforts and costs of sending the additional letter.

The questionnaire was designed according to recommendations found in general social research methods (Cavana et al., 2001; Neuman, 2003; Zikmund, 1997; Sekeran, 2003). Keeping in mind the length of the questionnaire and the usually low rate of response, a decision was made to send only one survey per organisation. Targeted key informants were IT executives, as they are usually the most involved in SISP (Earl, 1993; Segars and Grover, 1998; King, 1995). This approach could introduce some sample bias. However, the questionnaire was designed to avoid subjectivity as much as possible by introducing structured, close-ended questions. To asses the validity of the answers, questions regarding respondent's SISP involvement and experience in SISP were asked.

All questionnaires were sent directly to CIOs accompanied with the letter of confidentiality and objectives of the questionnaire. A copy of the questionnaire is presented in Appendix C.

3.5.3.2 Sampling Frame

The sampling frame was used a listing in the MIS 100 (2003) of the top Australian companies and an extensive Australian company database called ‘Australia’s Business Who’s Who’. The MIS 100 lists the top 100 companies in terms of number of computer screens which is a fair indication that these companies are significantly involved in SISP and will considerably contribute in the understanding SISP in Australia. To make the results of this study generalizable, a list of companies was compiled for a wide variety of industries, being small, medium and big in terms of both, the annual turnover and number of employees. So far a very small percentage of SISP research is related to small and medium companies (Robinson and Pearce, 1984; Teo et al., 1997). However, the majority of Australian organisations fall in that category and it is important to avoid a heavy bias towards large organisations. Also, attention was paid to the geographic distribution of the companies. As this research is concerned with SISP maturity on a national level, both public and private sectors across a variety of industry types were considered.

3.5.3.3 Questionnaire Presentation

The questionnaire comprised four parts. The first part measures the characteristics of respondents through 32 items comprising 7 scales. The second part collects the characteristics of the surveyed organisation such as industry type, location, turnover, etc. Part three of the survey concerns the SISP assessment and part four has questions about the measurement of SISP.

3.5.3.4 Pilot Survey

A pilot survey was used to test the data collection method. It was conducted in two ways. Firstly the content of the questionnaire was discussed and refined through intense debate amongst three prominent SISP practitioners being IT managers from three different industry type of organisations. Secondly, the pilot survey was completed on five organisations. The targeted companies were from banking, food and manufacturing, telecommunications and education, and also were small, medium and large in size. The questionnaire is shown in Appendix C and the scores of pilot SISP maturity model obtained in Appendix D. Before sending the questionnaires, contact was made with the

CIOs by email and telephone to ensure that the pilot questionnaires will be answered. All five organisations returned the questionnaire with very few suggestions. Those responses obtained were added to other responses.

3.5.4 Data Analysis

All standard statistical tests were conducted using SPSS in order to find answers to the identified research questions and hypotheses. Different statistical techniques (mainly nonparametric as data are not normally distributed) were used according to the type, number and measurement scale of the variables. Crosstabulations were used to find frequencies and relationships (the Pearson chi-square) for dichotomous, nominal variables, and ordinal variables consisting up to 3 levels. At the same time, to calculate the strength of a relationship, the Phi coefficient was selected for dichotomous and nominal variables and Spearman's correlation coefficient, rho or Kendall’s tau was used for ordinal variables consisting up to 3 levels (Cavana et al., 2001). By convention, values of 0.3 or higher for the Phi coefficient and 0.15 or higher for Spearman's rho and Kendall’s tau are accepted as an indication of the strong relationships.

The Bivariate Correlation procedure was used to compute the Spearman's rho correlation coefficient with its significance levels for ordinal (more than 3 categories) and interval scales. The nonparametric Spearman's rho is a measure of association between rank orders, with an absolute value from 0 to 1 and a direction of the relationships (-) or (+).It works regardless of the distributions of the variables. When a correlation is confirmed with an approximate significance value of <0.05, correlation is assumed strong if Spearman rho correlation is >0.15. Also, this procedure can be used for dichotomies (dummy) variables. Generally, SPSS calculates the exact correlation for continuous as well as for dichotomous variables (Norusis, 1988).

A one-way analysis of variance (ANOVA) and Means procedure was used to test for the difference in the means of one dependent (interval) variables and one or more independent (ordinal-more than 3 categories) variables.

Hypotheses were defined in Chapter 2 and tested in Chapter 6. Table 3.5 shows the variables involved in hypothesis testing.

Table 3.5 Variables Definition for Hypotheses Testing

Number	Description	Variables
H1	As SISP evolves towards higher maturity levels, the level of SISP benefits will increase	SISP Maturity Q41
H2	The existence of a formal approach to SISP planning will have a favourable effect on the overall success of SISP	Q21, Q22, Q23 Q42
H3	As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases.	Q22 SISP Maturity
H4	As the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases.	Q36, Q37 SISP Maturity
H5	If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful.	Q25 Q42
H6	As senior management commitment towards SISP increases, SISP success increases.	Q26 Q42
H7	As awareness towards cultural issues and other causes of resistance increases, SISP success increases.	Q33 Q42
H8	A more skilful SISP team produces more successful SISP.	Q20 Q42
H9	Regular change reviews will positively influence the success of SISP.	Q29 Q42
H10	The more mature SISP, the more satisfaction is obtained with the accomplishment of SISP measurement objectives.	Q48 SISP Maturity
H11	The more mature SISPis, the more the impact of external environmental factors is considered.	Q28 SISP Maturity
H12	A firm's immediate environmental factors have greater influence on SISP success than general external environmental factors.	Q40 Q42
H13	As SISP evolves towards higher maturity levels, the level of planning success will increase.	SISP Maturity Q42
H14	The larger the organisation, the greater the level of SISP maturity	SISP Maturity Q10 to Q13

3.6 Techniques and Tools Used For SISP Models

This research develops a theoretical SISP maturity model and operationalizes it through two techniques, one being analytical hierarchy and network process theory (AHP/ANP), and the other being the conventional statistical framework of structural equation modelling through the likelihood estimation.

3.6.1 ANP/AHP Theory

The research questions imposed a need to search for a tool which can effectively help in the measurement of relationships between SISP variables in a structured way. It was found that analytic thinking theory can facilitate the development of SISP maturity model. AHP and ANP are two techniques that utilise analytic thinking. Those techniques offer the powerful use of ratio scales to measure physical and social domains. ‘Ratio scales are what social scientists need in their research to create and analyse data deriving from judgements along with statistical information’ (Saaty, 2001a:xii). This section briefly explains ANP/AHP and demonstrates how these techniques were adapted for research purposes. Full information on the theory can be found in Saaty (2001a, 2001b).

ANP and AHP are advanced multi-criteria decision making techniques based on relative measurements (Saaty, 2001a; Saaty, 2001b). This is a nonlinear framework which enables appropriate investigation of the SISP construct relations as SISP is non-linear process. These techniques use the natural principles of analytic thinking: the principle of constructing hierarchies and networks, the principle of establishing priorities, and the principle of logical consistency for identifying, understanding and assessing the interactions of a system as a whole. A simple, hierarchic structure consists of a goal, criteria, and alternatives. Feedback structures do not have a hierarchy appearance; they are a network, as they try to depict the interaction and dependence of higher-level elements on lower-level and vice versa. It means that the importance of criteria determines the importance of alternatives, but also the importance of alternatives themselves determines the importance of the criteria. Feedback can cause an unimportant element to become important.

This theory is based on seven perspectives: 1) Ratio scales, proportionality, and normalized ratio scales, 2) Reciprocal paired comparisons, 3) Sensitivity of the principal right eigenvector, 4) Homogeneity and clustering, 5) Synthesis that can be extended to dependence and feedback, 6) Rank preservation and reversal, and 7) Group judgements.

3.6.1.1 Paired Comparison

AHP is a decision making theory that explores the relationships of the goal, objectives (criteria), sub-objectives (subcriteria) and alternatives to enable decision-makers to select the best alternative. In general, having established hierarchies or feedback networks, judgements are made or measurements are performed on pairs of elements with respect to a controlling element to derive ratio scales that are then synthesized throughout the structure to select the best alternative.

As was described earlier, a system can be decomposed into subsystems, components, and elements where the sum of the parts, due to synergy, may not be equal (larger or smaller) to the whole system. Criteria are used for pairwise comparing of components (clusters) and elements (nodes). The generic question to be answered by making pairwise comparison is: ‘Given a control criterion (subcriterion), a component (element) of the network, and given a pair of components (element), how much more does a given member of the pair influence that component (element) with respect to the control criterion (subcriterion) than the other member?' (Saaty, 2001a:93). The Super Decisions [1] software (version 1.4.1, that implements the ANP/AHP for the personal computers) was used to provide mathematical procedures to synthesize the model to produce the best rank order relative to the model structure. Synthesis is needed as each component has a highest ranked element and they cannot all be first in the system. Thus, the components themselves, according to their influence on each component in the system with respect to a higher order control criteria need to be compared.

ANP is used for absolute and relative comparison. In relative comparisons, elements are compared in pairs according to a common attribute. In absolute comparisons, elements are compared with a standard in one's memory that has been developed through experience. In the case of different measurement scales (they cannot be directly combined), the process of prioritisation and relative ratio scale is used to avoid use of any kind of unit. When forming the ratio, a single number is drawn from the fundamental 1-9 scale of absolute numbers. The fundamental scale used for paired comparison judgements is shown in Table 3.2.

As SISP assessment modelling mostly deals with intangible attributes, it is important to point out that there is a nontrivial way to quantify intangibles through relative measurement and derive priorities for them.

Overall, ANP is based on three principles: decomposition, measurement of preferences, and synthesis. When priorities are derived for all comparisons, the local priorities are synthesized to derive a global measure of priority, normally used in making the final decision.

This research explores ANP characteristics and deploys this theory in a unique way. The five stages of SISP maturity are organised as a node of alternatives against which are all construct/attributes judged with respect to the overall all goal of efficient, effective and manoeuvrable SISP planning.

3.6.1.2 The Supermatrix

In feedback ANP, the elements are represented as nodes of the network. Two nodes are connected by an arc if there is dependency between them.

[1] Super Decisions is a software package developed by Rosann Saaty and William Adams

Let C_h, h=1...m be all components (clusters) identified in the SISP model, and assume that every component has n_h elements e_{h1}, e_{h2},... e_{hm_h}. The influence in a given set of elements in a component on any element in the system is represented by a priority vector derived from paired comparison. To obtain global priorities, the local priorities vectors are arranged in the appropriate columns of a matrix of influence among the elements, known as the supermatrix. This matrix represents dependencies between nodes as well as the influence from the node elements to itself.

$$
W = \begin{array}{cc}
 & \begin{array}{cccc} C_1 & C_2 & \cdots & C_m \\ e_{11}e_{12}\cdots e_{1n_1} & e_{21}e_{22}\cdots e_{2n_2} & & e_{m1}e_{m2}\cdots e_{mn_m} \end{array} \\
\begin{array}{cc} & e_{11} \\ C_1 & e_{12} \\ & \vdots \\ & e_{1n_1} \\ & e_{21} \\ C_2 & e_{22} \\ & \vdots \\ & e_{2n_2} \\ \vdots & \vdots \\ & e_{m1} \\ & e_{m2} \\ C_m & \vdots \\ & e_{mn_m} \end{array} &
\begin{bmatrix} W_{11} & W_{12} & \cdots & W_{1m} \\ W_{21} & W_{22} & \cdots & W_{2m} \\ \vdots & \vdots & \vdots\vdots\vdots & \vdots \\ W_{m1} & W_{m2} & \cdots & W_{mm} \end{bmatrix}
\end{array}
$$

In simple terms, a supermatrix is a matrix in which elements (blocks) are matrices. A typical block is a matrix of the form:

$$
W_{ij} = \begin{bmatrix} w_{i_1 j_1} & w_{i_1 j_2} & \cdots & w_{i_1 j_{n_j}} \\ w_{i_2 j_1} & w_{i_2 j_2} & \cdots & w_{i_2 j_{n_j}} \\ \vdots & \vdots & \vdots\vdots\vdots & \vdots \\ w_{i_{n_i} j_1} & w_{i_{n_i} j_2} & \cdots & w_{i_{n_i} j_{n_j}} \end{bmatrix}
$$

Each column *Wij* is an eigenvector (a derived scale) of the influence of the elements in the *ith* component of the network on an element in the *jth* component. To obtain priorities, the supermatrix must first be transformed to a matrix whose columns sum to unity, known as the Weighted supermatrix, which is a stochastic type matrix. This stochastic matrix is used to derive the desired priorities by transforming it to a Limit Supermatrix. The Weighted supermatrix itself gives the direct influence of any element on any other element. To take in account the influence of an element on a second element indirectly through its influence on some third element and then by the influence on that element on the second, the Weighted supermatrix must be squared. There are potentially many third elements. Also, the influence of one element on another can occur by considering a third element that influences a fourth element, which in turn influences the second element, and so on. Thus, we can have an infinite sequence of influence matrices: the matrix itself, its square, its cube, etc. When the limit of the average of a sequence of N of these powers of the supermatrix is taken, the Limit matrix is obtained and this matrix yields a limit priority of influence of each element on every other element.

The supermatrix representation of three levels is given by:

$$W = \begin{pmatrix} 0 & 0 & 0 \\ X & Y & 0 \\ 0 & Z & I \end{pmatrix}$$

where X, Y and Z are goal, criteria, and alternatives matrices respectively. I is the unity or identity matrix. W is column stochastic priority matrix. In this example, criteria are dependent among themselves. Zero in the matrix indicates no interdependency among nodes.

The supermatrix needs to be raised to a sufficiently large power to obtain the transmission of influence along all possible paths of the supermatrix (as described above). Thus the *kth* power of W will capture the influence along the path of length *k* and is represented as:

$$W^k = \begin{pmatrix} 0 & 0 & 0 \\ Y^{k-1}X & Y^k & 0 \\ Z\sum_{i=0}^{n-2} Y^i X & Z\sum_{i=0}^{n-1} Y^i & I \end{pmatrix}$$

and the priorities are obtained from the limit of Wk as k->∞. W is obtained as:

$$W^{\infty} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ Z(I-Y)^{-1}X & Z(I-Y)^{-1} & I \end{pmatrix}$$

The 'Super Decisions' software package is used for the calculation of weights and priorities.

3.6.1.3 The Consistency of a System

During pairwise comparisons, it is possible to introduce errors by inconsistency in judgements. These errors are distributed among alternatives when the eigenvector is computed and the average is taken over all transitivities. Consistency can be measured by multiplying the consistency of each matrix by the priority of its criterion and adding them. This result is then compared with a similar number obtained from random matrices of the same size (Table 3.3). If the number of elements is small, then their relative priorities are large and are less affected by inconsistency adjustment. For this reason, it is suggested to limit the number of elements to seven in hierarchical structures.

The consistency index of a matrix of comparisons is given by,

$C_H = \sum_{j=1}^{h} \sum_{i=1}^{n_{ij+1}} w_{ij} \mu_{ij+1}$, where *wij=1* for *j=1*, and *nij+1* is the number of elements of the *(j+1)*st level with respect to the *ith* criterion of the *jth* level.

and the consistency index for a supermatrix is defined by this relation,

$$C_s = \sum_{\substack{control \\ criteria}} K_c \sum_{\substack{all \\ chains}} (\sum_{j=1}^{h} \sum_{i=1}^{n_{i1+1}} w_{ij} \mu_{i\,j+1} + \sum_{\substack{control \\ criteria}} K \sum_{k=1}^{s} \sum_{j=1}^{n_k} w_{jk} \sum_{h=1}^{|c_h|} w_{(k)(h)} \mu_k (j,h)$$

,

where *Kc* are the priorities of the supercriteria in the control hierarchy and *n* is the number of elements and μ is the consistency index of all elements with the respect to the criterion.

In both cases, this index must be divided by the corresponding index with random inconsistencies. Normally the consistency ratio should be less than 0.10 to avoid concerns about judgements.

3.6.2 Steps in Developing the SISP Models using ANP/AHP

The SISP criteria and subcriteria were organised in a hierarchy and the influencing factors in a network because they involve the interaction and dependence of higher level elements on lower level elements. Every network (shown as 'Subnet' on Figure 4.2, Chapter 4) has the 'Alternatives' cluster (ref to Figure 4.3, Chapter 4) which elements (nodes) are the five stages of SISP maturity. Subnets were not used to evaluate alternatives; instead alternatives were used to evaluate all elements with respect to the overall goal of efficient, effective and manoeuvrable SISP planning. When the model was synthesized, the alternatives were ranked, using ordinal values which confirmed the validity of the comparative judgement the study performed.

To develop the SISP maturity model and the model for assessment of SISP maturity in organisations absolute and relative measurement was performed and these steps are as follows:

Application of Relative Ranking (for the development of the ranked SISP maturity stages). To overcome the computational difficulties associated with a large number of input variables, an iterative approach to modelling of the decomposed system was chosen. Components/elements, whose influence on SISP is insignificant, were eliminated. It is not possible to reduce complexity artificially into a very simple structure and claim that the model is an acceptable representation of the real world. As Saaty (2001a) demonstrates, it is possible to organise reasoning and calculations in sophisticated, but simple ways, to deal with the relative complexity of the model. Following that, at the end of the iterative process a limited number of components (clusters) where the elements (nodes) in each component interact and/or have an influence on all or some elements of another component with respect to the criteria was accepted.

In Chapter 2, the five stages of SIS planning maturity were derived from the literature review. They are logically ranked from the rank 1(the highest stage) to the rank 5 (the least mature stage of SISP). However, the relative importance of each SISP maturity stage is not known (on a scale 0 to 1). To obtain the relative ranking of each SISP stage, prioritizing the SISP criteria and subcriteria as well as all elements involved was needed. Priorities were found by pairwise comparisons in respect to relevant criteria. SISP maturity stages ('Alternatives') were used to prioritize each element (node) with respect to the subcriteria. Then, the overall synthesis was conducted to provide the relative ranking for each maturity stage. The obtained scores were in the range of 0 to 1. If their values correspond to the maturity stages in a logical order, the judgements are valid and the model is proven, i.e. the Rudimentary planning level scores the lowest value, Ineffectual planning scores higher then Rudimentary level and so on and the highest ranked SISP stage receives 1.

Application of absolute Rating combined with Benchmarking (the model for SISP assessment in an organisation). The previously created model now needs to be setup to calculate ratings. The advantage of a rating model is that the evaluation structure is already setup and each criterion is evaluated as to how it performs on each alternative. This dramatically shortens the number of judgments required (Saaty, 2003). The highest ranked SISP stage was selected and then a specific intensity scale was defined for each node. In 'Super Decision Ratings', the nodes were called criteria as they were prioritised during the relative ranking, and the scales were called criteria categories. The scales are the same as ones used for the survey. In addition, prioritizing the rating words themselves was performed (a "High' rating, for example, is twice as good as 'Medium' rating). Then, the 'Alternative' was entered as an imaginary 'Benchmark' organisation and evaluated against prioritized criteria such that it scored the highest rate for each criterion. When the whole model was synthesised, this benchmark organisation scored the highest rate (1) and it was the benchmark organisation against which to compare any other organisation in terms of SISP maturity. To summarise this step: a new Rating model was established by defining the scale for each prioritized node and established one 'alternative' which is the benchmark organisation.

SISP Assessment of an organisation. Now the assessment of SISP maturity for real organisations can be performed. This is a process of building a ratings spreadsheet where the alternatives are the organisations and criteria categories (scale scores) are obtained from the questionnaire. The compared SISP will score certain weight against the benchmark on every criterion. When the model was synthesized, the result obtained was an overall score for the compared organisation. This result was then compared with the benchmark to assess the degree of how close (or far) is the organisation from achieving the highest level of SISP maturity. The score obtained (0 to 1) has no straight indication of the maturity level of the assessed organisation; it needs to be manually compared with scores obtained for each SISP maturity level or this process can be automated by using other methods, for example a function in a spreadsheet.

Explanations of the above steps are depicted graphically in Figure 3.2. This figure in essence represents the research framework.

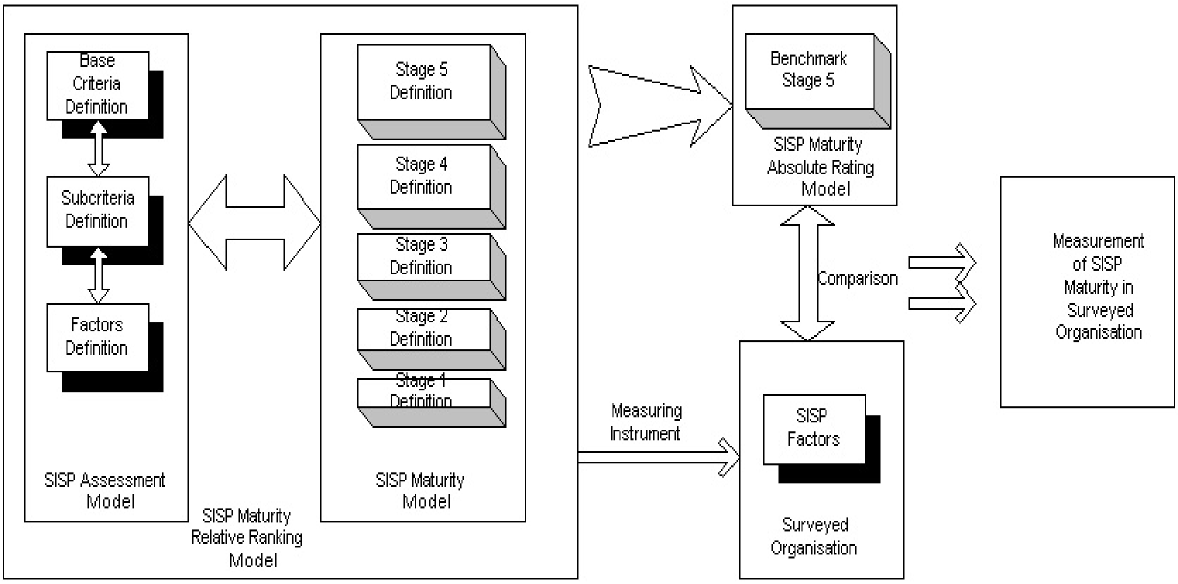


Figure 3.2 Schematic Representation of the Research Framework

3.6.3 Structural Equation Modelling

Structural Equation Modelling (SEM) is a statistical methodology used to confirm theoretical constructs that cannot be observed directly by explaining how the measured and unobserved (latent) variables are related to one another. Thus, SEM provides a means to assess the extent to which a hypothesised model matches the sample data. In this case, the abstract phenomena termed as SISP Effectiveness, Efficiency and Manoeuvrability are the three second-order latent (unobserved) variables, or factors fully explained by the six first-order latent factors. The observed or measured variables are coded responses from the SISP survey and they are presumed to represent the first-order latent variables. The aim of this model-testing procedure is to test the goodness of fit between the hypothesized model and the sample data.

In general SEM is a process done in two steps (Anderson and Gerbing, 1988): establishment of a measurement model which depicts the links between the latent variables and their observed measures, and establishment of a structural model which depicts the links among the latent variables themselves. The measurement model is actually the factor-analytic model (confirmatory factor analysis (CFA) used) and the structural model is a formal estimation of path coefficients, together comprising the full latent variable model. The structural model can be further decomposed to: model identification, estimation, test of fit and respecification. Respecification is not a necessary step but it is most commonly performed (Joreskog, 1993). He proposed three scenarios for testing structural equation models: (1) strictly confirmatory (either reject or fail to reject the model and no further modifications to the model is made), (2) the alternative models (from several alternative models select one which best fit the data), and (3) model generating (a rejected model is respecified). The most common approach is 'model generating'. The rationale for this scenario lies in the cost associated with the collection of data which makes it hard to afford to terminate the research on the basis of a rejected hypothesized model.

The proposed methodology for SISP maturity model testing is based on Kline (1998), Byrne (2001) and Joreskog (1993) suggestions. The framework followed can be summarised as follows:

1. Testing for the Factorial Validity of Scores from a Measuring Instrument (Measurement model):
    - test for a first-order single-factor model;
    - test for a first-order three-factor model;
    - test the hypothesized first-order six factors model;
    - (test for convergent and discriminant validity and adequacy of the parameter estimates).
2. Testing for the Factorial Validity of Scores from a Measuring Instrument (Second Order CFA model)
    - goodness of fit for a second-order single factor model; and
    - goodness of fit for the hypothesized second-order three-factor model.
3. Testing the Structural model (Third-Order model)
    - parameter estimation; and
    - test of fit.

The SISP model hypothesized a priory that:

- Responses to SISP can be explained by six first-order factors (Form and Content, Collaboration, Stakeholders' Designation, Technology, Time Dimension, and Viability), three second-order factors (Efficiency, Effectiveness and Manoeuvrability) and one third-order factor being mature (successful) SISP;

- Each item-pair measure would have a non-zero loading on the first-order factor it was designed to measure (convergent validity), and zero loadings on the other five first-order factors (discriminant validity);
- The six first-order SISP factors, consistent with the theory, are correlated;
- Covariance between the six first-order factors would be explained by their regression on the three second-order factors;
- Covariation between the three second-order factors would be explained by their regression on the third-order factor (SISP success); and
- Error/uniqueness associated with each measured variable is uncorrelated.

The test for the adequacy of the models (both the measurement and structural) is based on various goodness of fit criteria. All statistical analyses are performed using Statistical Package for the Social Sciences (SPSS) for Windows, release 11.0 and AMOS 5 Structural Equation Modelling procedure in SPSS (Arbuckle and Wothke, 1999). The AMOS program provides various fit indexes; the study reports all of them in Appendix F and discusses only selected indexes which are widely used in the statistical literature and in particular recommended by Kline (1998), Bentler (1990) and Byrne (2001).

The recommended cut off for the criteria the study reports are: minimum discrepancy known as Chi-square (ideally 0, and $p>0.05$), Normed Chi-square (the ratio of chi-square to the degrees of freedom) $\chi 2/df < 3$; the Root Mean Square Residual (RMR) < 0.05; the Goodness of Fit Index (GFI) >0.95; the Adjusted Goodness of Fit Index (AGFI) >0.90; the Normed Fit Index (NFI) > 0.90 and the Root Mean Square Error of Approximation (RMSEA) < 0.08. The study reports the Parsimony adjusted Comparative Fit Index (cut off PCFI >0.50) which takes care of a model complexity. In this case, the model has only two observed variables per latent factor which has a higher apparent fit than a model with more observed variables per factor. However, multivariate normality of data is not assumed, thus the overall chi-square fit statistic for the model as a whole is biased toward Type I error (rejecting a model which should not be rejected). Lack of multivariate normality is addressed by implementation of the bootstrapping procedure, described in more details in Chapter 5.

The study also reports Hoelter's critical N (index address adequacy of sample size). The literature reports two stands on Hoelter's index value: Byrne (2001) states that Hoelter proposed that a value of this statistics should exceed 200 for good fit models but some research argue that Hoelter's index is the largest sample size for which one would accept a model at the 0.05 (.01) level of confidence. This work does not discuss definitions of goodness of fit statistics as they are well documented in the statistical literature.

One of most informative statistical criteria is the root mean square error of approximation (RMSEA). Values for RMSEA less than 0.05 indicate close fit, values in the range from 0.05 to 0.08 indicate fair fit, and values greater than 0.08 indicate poor fit. In case where $\chi 2$ difference between various models are compared, a value for $\Delta\chi 2 > 3.84$ is considered significant. Also, the $\chi 2$ distribution with a probability of $p<0.05$ is considered significant (the null hypothesis that the model fits the data should be rejected). Critical Ratio (CR) is a measure used to test the statistical significance of parameter estimates. Based on a level of 0.05, the CR needs to be $>\pm 1.96$ before the hypothesis (the estimate equals 0) can be rejected. Non significant parameters in the interest of parsimony should be deleted from the model.

The model misspecification analysis phase involves modification to the hypothesized model to improve fitting the data. To detect areas of misspecification the modification indices (MI) and the standardized residuals information provided by SPSS AMOS are used. Models that fit well the data should not have standardized residuals (the discrepancy between the fitted and the sample covariance matrix) greater than 2.58. The maximum likelihood (ML) estimation is used in conjunction with SEM.

3.6.4 Summary of the Research Design and Methodology

Table 3.6 summarises the position adopted in regard to the adopted research methodology, Techniques and Tools.

Table 3.6 Summary of the Research Design and Methodology Adopted for this Study

Research Design	Position Adopted
Philosophical Concept epistemology ontology	Philosophical Concept broadly positivist internal realism
Purpose of the study exploratory descriptive hypothesis testing case study	Purpose of the study descriptive (engineering approach with analytic thinking) hypothesis testing

Research Design	Position Adopted
Types of investigation clarification correlational causal experimental	Types of investigation correlational
Extent of researcher interference minimal disruption (detached observer) significant disruption	Extent of researcher interference detached observer
Unit of analysis individuals dyads groups organisations nations cultures	Unit of analysis organisations
Time horizon cross-sectional longitudinal	Time horizon cross-sectional
Research Methodology, Techniques and Tools	**Position Adopted**
Measurement and Measures operational definition -dimensions and elements	The study investigates the three key constructs, being Effectiveness, Efficiency and Manoeuvrability. Subdimensions and elements are shown in Table 0.1 Appendix B.
Measurement and Measures measurement scale	The study uses nominal, ordinal, interval and ratio scales
Quantitative data collection questionnaires experimental designs	Questionnaire administrated by mail
Sampling design probability/non-probability sample size (n)	Sampling frame 2000, sampling error 0.02 at 95% confidence level
Research Tools Proprietary Tool Statistical tool	Super Decisions for AHP/ANP SPSS (11.0)/AMOS 5 for Structural Equation Modelling and other statistical analysis

3.7 Conclusion

In this Chapter, the adoption of the internal realism ontology of the non-positivist paradigm is justified. Next, the research plan and the focus of the research are presented. Then, the research design, methodology, techniques, and tools are discussed in depth.

The research is defined as a descriptive study which will mainly utilise the analytic thinking and the engineering approach to address the research question of how the SISP maturity can be modelled. The research adopts a mail questionnaire as the most appropriate way of data collection. The design of the research instrument is described and its reliability and validity is discussed. Then, the research tools AHP/ANP and SEM are presented.

In the next chapter, a unique perspective of SISP maturity levels in an organisational setting is presented and a conceptual SISP model using an Integral Engineering Approach is developed. Then, based on that approach, the model for the assessment of maturity levels in SISP is described.

CHAPTER 4

4 SISP MATURITY MODEL

4.1 Introduction

In this Chapter, a definitional perspective of SISP maturity is presented. In AHP/ANP terms, SISP maturity levels are defined as 'Alternatives'. Then, based on the Integral Engineering approach (described in Chapter 3) a SISP assessment model is developed. This approach favours the use of hierarchical structures, where information is fed top-down as well as bottom-up, i.e. the SISP system is decomposed into lower level subsystems. Each subsystem has its own subsystem(s) and so on. Subsystems are interconnected through their inputs/outputs (the output of one subsystem is the input to the other). Thus, modelling involves the definition of the layers – criteria, subcriteria, clusters (components of subcriteria), subclusters and nodes (key elements of subclusters) - organised as a feedback network structure as shown in Figure 4.1. Terminology like criteria, subcriteria, clusters and nodes is dictated by ANP/AHP theory. Criteria, and subcriteria correspond to SISP behaviour, and clusters and nodes correspond to SISP structure (described in Chapter 2).

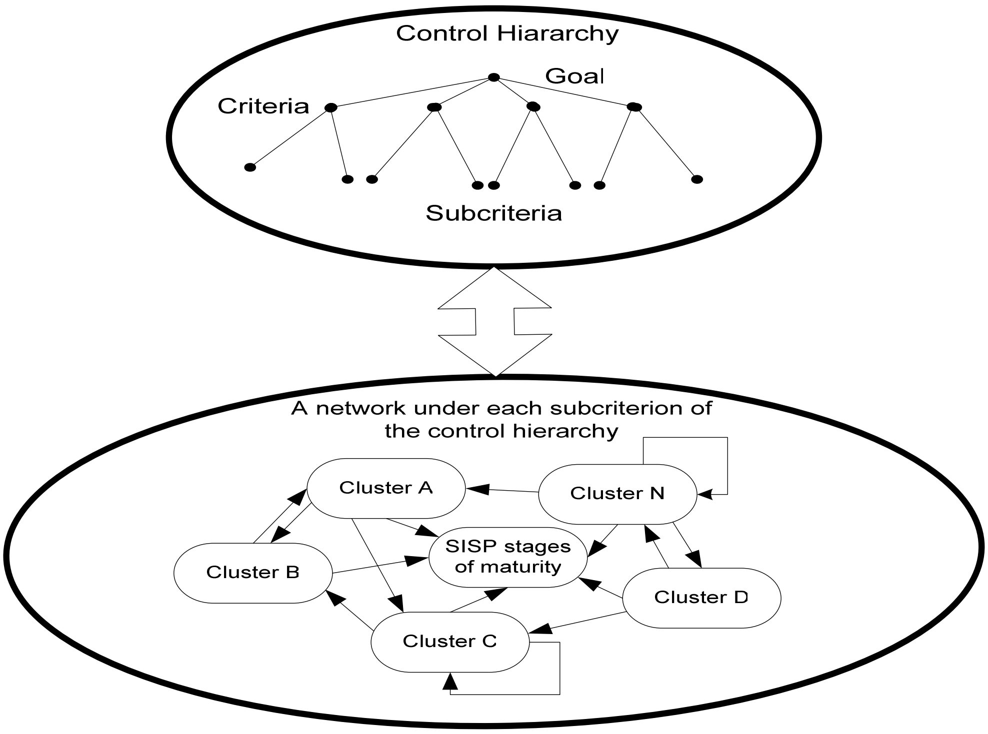


Figure 4.1 A General SISP Feedback Network Structure

At the beginning of the model development process, all a priory important components/elements found in the existing literature were used. To improve the consistency of judgements, for every iteration (the model was developed as an iterative process) clusters/nodes (components/elements) with which the consistency ratio (C.R.) are not acceptable or their weights are insignificant were eliminated. At the end of the process, there were a limited number of clusters whose nodes interacted and/or influenced all or some nodes of another clusters with respect to the criteria (Saaty, 2001a). The final set of clusters/nodes and the literature sources used for their definition is shown in Table 0.1, Appendix B.

After having defined layers, relationships and strengths of relationships between criteria, subcriteria, and clusters were established. The relative complexity of the model dictates very detailed and extensive efforts to organise reasoning and calculations in sophisticated but simple ways. Thus, this Chapter discusses the judgement of the importance of each criterion, priorities given to the subcriteria with the respect to the main criteria and the evaluation of nodes against the stages of SISP maturity. At the end, a model synthesis is conducted and the results discussed.

4.2 SISP Maturity Definition

The study defines maturity as the degree to which the SISP formulation and formation processes are defined, measured, and controlled. The maturity levels are distinct and well defined stages aimed towards achieving a mature SISP. For the purpose of this research, the following generalised definition of the highest stage of SISP maturity is established:

> *An organisation achieves the highest stage of strategic information system planning if it possesses an IT/IS strategic plan, fully aligned with business goals, which accurately references, at any point in time, current or target IT themes which provide data of high quality, accuracy, availability, and shareability for informed decisions that will give the organisation a competitive advantage.*

This definition does not imply excessive planning efforts but an efficient and effective way of planning and monitoring. It also combines the general planning dimension with the alignment, competitive and dynamic dimensions of SISP. (Reich and Benbasat, 2003; Galliers, 1987, 1991; Willcocks, 2000; McBride, 1998).

The highest level of SISP maturity is recognised as the Adaptable Planning level, where the SISP reflects cohesive relationships among processes involved (a call for data integration enterprise-wide to turn data challenges into business opportunities is a contemporary demand, Laney, 2004). Cohesion as defined by Oliver (1990) is commitment, which is the feeling of obligation or being bound to organization values or norms. Cohesion implies all forces acting in a way that binds them together in achieving their missions in an organization.

Cohesion applies not only to the vertical integration mechanisms within organisations (internal virtualisation) but also to IT horizontal integration (external virtualisation) for managing interdependence between organisations (Grandori and Soda, 1995; Yang and Jude 2004). An example of horizontal integration is GrangeNet, the network which links research institutions and universities located in major Australian cities). In that regard, a strategic information systems plan at the highest maturity level of planning will select policies and themes that will strategically support/drive the organisation towards internal/external integration.

4.3 The Five-Stage SISP Maturity Model

As was shown in the literature review (Chapter 2) there is a lack of SISP maturity definition in regard to planning process. The literature is concerned with organisational or technological maturity. As the literature review demonstrates, it is evident that a plethora of different approaches and definitions of IS maturity exists. Individuality and creativity took over the solid, uniform build up and extension of prior work. However this may not be an unusual way of theory evolvement. This study acknowledges the lack of agreed concepts and put all efforts to reconcile old and contemporary views on SISP as a plan formulation and a plan formation. The following sections provide the definition of a five-stage SISP maturity model. This research follows Bhabuta (1988), Grover and Segars (2005), Ward and Peppard (2002) works in regard to the evolution of IS/IT strategy processes. The study has an emphasis on the planning outcomes, and defines the maturity stages as: Rudimentary Planning, Ineffectual Planning, Attainable Planning - Causing Federalisation, Sustainable Planning- achieving Adhesion, and Adaptable Planning–achieving Cohesion.

4.3.1 Rudimentary Planning

At this level of planning, the organisation does not have a formal IT plan. Plans are ad hoc, basic, and very often just financial plans to acquire hardware and software. There is no adequate IT planning nor IT technical resources. Very often, the decision of what to acquire is made by senior management following the advice of external consultants.

There is no analysis of the external environment and its impact on business before acquiring IT/IS. Milestones are used in place of goals and objectives. The organisation is concerned about costs and will acquire a cost effective solution for the current situation regardless of future needs.

4.3.2 Ineffectual Planning

SISP is a formal, but basic process. No effective planning is performed. Plans are more tactical than strategic, out of date, and incomplete. The IS plan addresses only technical issues. It is usually undertaken as part of the annual budgetary process and is a one-shot activity. Very often, IT projects are just embedded in the business plan. IS/IT ad hoc selection criteria are used. Senior management is involved in certain planning activities. IS vision, goals, and objectives are set but are not aligned with business goals. Information input to the planning process is not a result of a comprehensive environmental analysis. The need for use of formal methodologies and structured techniques is acknowledged but not consistently implemented. Established policies are very often abandoned under the pressure of deadlines and lack of commitment from the managerial structure.

4.3.3 Attainable Planning (Causing Federalisation)

The organisation adopts a methodological approach for SISP and produces a complete strategic plan which is current to within one year and largely followed. SISP goals are aligned with departmental business goals. Very often, IS projects are embedded in the IS plan. Management is involved in SISP formulation, evaluation, and control. The IS department is technically strong and perform planning, development, and control centrally. Implemented systems cover major business areas, but very often they are far from real business needs. At the same time, end users deploy many different computing systems in an uncoordinated manner. They prepare their own IT operational plans in isolation from other IT plans and they are inconsistent in the form and content with the other plans. Thus, an organisation acts as a federation, having a central IS/IT department which dictates an overall IS strategy but some other departments have miniature IS/IT functions which retain their own control on IS initiatives.

4.3.4 Sustainable Planning (Achieving Adhesion)

In this maturity stage, emphasis is on integration, coordination, and information sharing. SISP is principally driven by business needs and acts as an agent for the adhesion of internal functions. Plans are independent of any particular information technology and they identify synergistic opportunities across internal functions, take into account external factors, organisational culture, and other internal factors. Any planning inconsistencies are overcome through synchronisation by the central IT planning function if established, or coordinated across different business units. Thus, SISP success doesn't depend on a particular champion and it is rather a process for repeatable success. SISP review meetings that promote organisational learning and performance feedback mechanisms are in place, but they are event-driven and episodic rather than continuous. Assessing and meeting customer needs is the one of main targets. The importance of the IT function is widely recognised. Integrated relations are established throughout the organisation as all areas gain understanding of other areas and work together towards common goals.

4.3.5 Adaptable Planning (Achieving Cohesion)

SISP is used to guide core business activities and influences organisational goals by using the IS capability for gaining competitive advantage. Based on feedback, SISP is a continuous and emerging process rather than an episodic one, it is able to detect relevant emerging environmental patterns and help them take shape. SISP is dynamically synchronised with business needs; it is both structured and informal to promote innovative ideas, creativity and act proactively (Mintzberg, Ahlstrand and Lampel, 1998, McBride, 1998). High quality partnership relations with the business function are established and maintained ('fusing business knowledge and IS knowledge', Ward and Peppard, 2002). Adaptable, multiple scenarios planning that explore the interaction of the system with relevant environmental, social, political, technological, and economic factors are in place and strategically increase organisational manoeuvrability. Optimisation, focus on quality, monitoring, and control are continuous processes. The outcome of SISP is more likely to be policies rather than application definitions (McBride, 1998).

An excellent and distinctive IS capability enables sophisticated SISP to focus on strategic alliances in the marketplace (horizontal integration, external virtualisation), thus achieving cohesion between partner organisations to sustain competitive advantage, or achieve cohesion between position and capability (vertical integration, internal virtualisation).

4.4 SISP Maturity Assessment Evaluation Criteria

To be fast, flexible and focused are the main imperatives of every plan. “Plans can and should be to the fullest possible extent objective, factual, logical, and realistic in establishing objectives and devising means to obtain them” (Steiner, 1969:20). Strategic planning should be judged by these attributes. To be focused or to have content of good quality may require thorough and extensive planning. If the planning process takes too long, the plan can be outdated even before its implementation. Who is to be involved, what tools to use, what should be content of the plan? Even if one can craft a high quality content plan, and finish it on time, it still may not be of any benefit. We are not planning for the sake of having a plan and then leaving it to sit on the shelf to collect dust. “ ..we need to isolate the formal procedures that really get converted into action, and then ask ourselves where these take place, under what conditions, how, and why” (Mintzberg, 1981:322). The plan must be a ‘live’ and beneficial document. Needless to say that the plan content has an influence on the plan usefulness. But what makes a plan ‘live’? Is it the process of how the plan is handled, communicated, and implemented? Surely that will help plan its ‘activation,’ but how is it kept ‘live’, current, relevant, and on top of that strategic?

It is worthwhile mentioning that planning process very often creates opposition for reasons such as: planning is seen as excuse for increased IT bureaucracy and normally does not produce any results; it is an unnecessary process (analysis creates paralysis); and it limits flexibility (work from a tactical plan is preferred).

4.4.1 SISP Maturity Criteria Definition

The attributes that define a ‘live’, useful, relevant plan, with high quality content are portrayed in Chapter 2 through the three main SISP behaviours (criteria), shown in Figure 4.2 and named as:

- Efficiency (King, 1988; Allen and Boyton, 1991; White, 1999; Powell, 1992; Worthington and Dollery, 2000);
- Effectiveness (Ramanujam and Venkatraman, 1987; Boynton and Zmud, 1987; King, 1988; Segars et al., 1998; Wang and Tai, 2003); and
- Manoeuvrability (Allen and Boyton, 1991; Boar, 1993; Mintzberg and Quinn, 1996; Palanisamy, 2005).

In simple terms, efficiency is doing things the right way, and avoiding wasted time and effort while effectiveness is doing the right things. It is the quality of being able to bring about an effect (either condition can occur without the other, Horngren, 1969) Fast, focused and flexible are just the base characteristics of efficiency, effectiveness and manoeuvrability, but the former ones have deeper dimensions. For example, manoeuvrability adds the full dynamic dimension to SISP to cover all dynamic influential aspects of the ever changing external and internal environment on SISP.

This three-dimensional skeleton of the SISP assessment model may imply a simplistic approach to such a complex task as SISP planning. The literature confirms (Flavel and Williams, 1996) that high level questions should constantly be asked of any strategy maker about the efficiency and effectiveness of the strategic plan. This study adds the third dimension, manoeuvrability, to reflect the contemporary demand on SISP dynamics. In the sections that follow, these dimensions are described in more details and their associated supporting literature is listed in Table 4.14 to Table 4.16.

4.4.1.1 Effectiveness

> *Vision without action is a dream. Action without vision is simply ping the time. Action with Vision is making a positive difference.*
>
> (Joel Barker, 1992)

In general terms, effectiveness is output-oriented and defined as the accomplishment of a desired objective (Horngren, 1969; Ward and Peppard, 2002). This study defines effectiveness as the primary gauge of SISP success, the concept which measures the quality of SISP output. Most of the literature (Flavel and Williams, 1996; Boynton and Zmud, 1987; Wang and Tai, 2003; Chan and Huff, 1993; Ramanujam and Venkatraman, 1987) explore effectiveness in the IS system domain. The research domain to the planning subsystem is narrowed. In the context of SISP, the plan effectiveness is defined by the following inputs:

- The adequacy of the form and content in terms of vision, mission and goals;
- The quality of attainment in meeting goals and objectives, in the first instance the alignment with business goals and objectives;
- The focus of the plan (i.e. enhance strategic decision-making process, enable competitive advantage or better market position);

- Quality of SISP formulation process (thorough analysis of environmental factors);
- Adoption and provision of policies, procedures, guiding principles, methodologies, legislation which ensure accomplishment of the intended purpose; and
- Skills and knowledge involved in the SISP formulation/formation process.

As already mentioned, the output of this construct is the overall quality of the SISP plan (ability to influence business strategy, ability to plan for information and knowledge management, balancing creativity with structural, formal approach, sustainability of benefits, awareness of opportunities).

Effectiveness is conceptualised using three perspectives: the fulfilment of planning objectives (end result – output); a generic system capability to achieve both creative and controlled formal planning (process); and the role and impact of planning on the company's performance (Ramanujam and Venkatraman, 1987). At the same time, the dominant impact on planning effectiveness is the resistance to planning and the resources constraint. This view is adopted as a base and argued that many properties Ramanujam and Venkatraman (1987) specify are rather the dimensions of efficiency than those of effectiveness.

Previous research was summarised with the suggestion that the Effectiveness of SISP be expressed by two major subdimensions (subcriteria) named as Form & Content and Collaboration with strong influence of Knowledge and Policies. These subdimensions are explained in the following sections.

4.4.1.2 Efficiency

Efficiency is a concept that measures the ratio of the output to the input of SISP. It is an optimum relationship between the input and the output (Horngren, 1969). This research sees it as a link between content and process. Doing things right, correctly, timely and accurately are the major attributes of efficiency. A conventional role of efficiency is usually cost saving. Contemporary trends (White, 1999; Powell, 1992; Worthington and Dollery, 2000) provide multidimensional aspects of efficient planning. The capability of having a successful SISP is examined not only through the assessment of resources and deployment of methods and technology but through relationships between coordination, knowledge sharing, learning, commitments and roles. The efficiency of SISP plans are defined through these inputs:

- Definition of steps and processes in developing SISP;
- Using as little resources as possible;
- Level of communication during the planning process;
- Commitments and roles (ownership of SISP and responsibilities);
- Deployment methods and technology to speedup the planning process (adoption fit for purpose methodology and ability to follow it consistently);
- Knowledge sharing; and
- Organisational learning;

The output is monitoring and control (ability to measure tangible and intangible performance factors for enhancement of SISP processes).

Ramanujam and Venkatraman (1987) introduced the social dimension of effective planning (resistance to planning). In Engineering terms, this dimension is defined as a disturbance, which is required to be monitored and controlled.

4.4.1.3 Manoeuvrability

> *"Adaptation means not clinging to fixed methods, but changing appropriately to events…those who can face the unprepared with preparation are victorious. The ability to gain victory by changing and adapting to the opponent is called genius"*
> (Sun Tzu, as cited by Boar, 1993)

'..the process of strategy making must always be dynamic, precisely because it is about change and can never know when or how environments will change', (Mintzberg, 1994:245). This concept reflects dynamic aspects of SISP. Responses to the rate of change of inputs reflect the quality of being adaptable. The importance of which is increasing with the ever changing internal and external environment (Boar, 1993; Mintzberg and Quinn, 1996). Manoeuvrability is concerned with these inputs:

- Scenario planning;
- Contingency planning;
- Planning time horizon

- Political issues;
- Social issues;
- History of SISP; and
- Organisational culture.

The output is monitoring and control (measurement of the current position against the internal and external environment in order to recognise the need to switch to a new scenario or to correct the existing strategy).

The study narrows Boar's (1993) wide view of manoeuvrability as the prime requirement of competitiveness by presenting it as the summation of the dynamic SISP attributes that reflect the current position against the internal and external environment in order to recognise the need to switch to a new scenario or to correct the existing one. Also, a dynamic theory of SISP as argued by McBride (1998) is found appropriate to be considered.

4.5 SISP Maturity Assessment Evaluation Subcriteria

The subcriteria and evaluating clusters are hierarchically organised as shown in Figure 4.2. The clusters are shown as 'Subnets' in Figure 4.2. The unique aspects of SISP planning are captured through the main criteria and subcriteria and inter-correlation is allowed among them as it normally happens in SISP practice. For the assessment model, the study do not question available SISP theory or validate constructs; in simple terms it is impossible to that as it would be an enormous task on it own right. Instead, as shown in Chapter 2, the information available is classified to suit the goal of this study, i.e. the assessment of SISP.

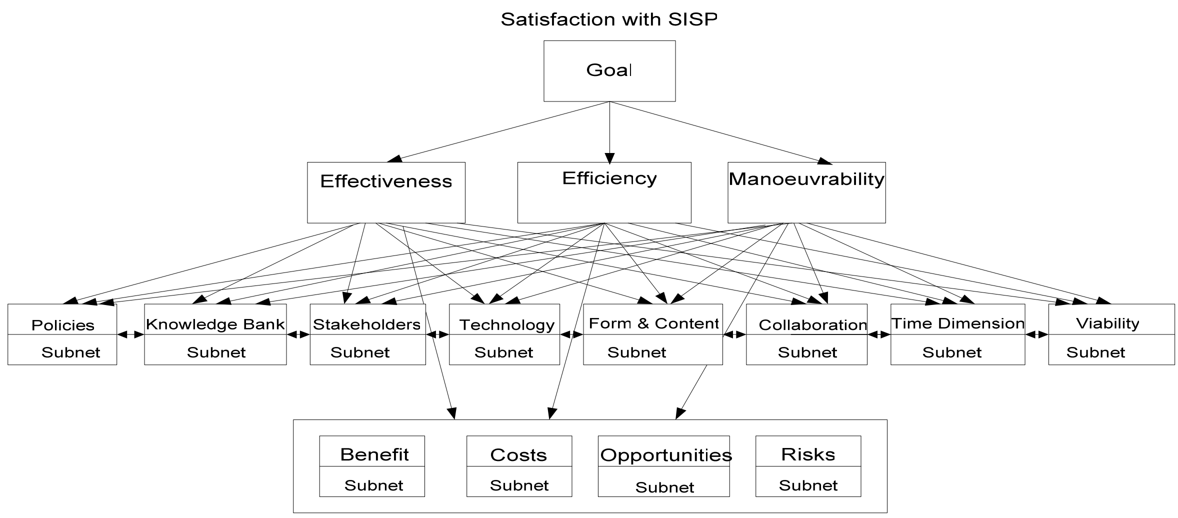


Figure 4.2 SISP Maturity Assessment Model: Control Criteria Hierarchy Structure

4.5.1 SISP Maturity Subcriteria Definition

This study identifies the subcriteria as: Form and Content, Collaboration, Policies, Stakeholders' Designation, Knowledge Bank, Technology, Time Dimension, and Viability. The subcriteria network is organised as shown in Table 4.1. The two powerful (distinct) subcriteria Policies and Knowledge have an effect on every criteria in a significant but varying influence, thus it would be inappropriate to associate them with only one construct of SISP. Table 4.1 shows the 'predominant' criteria/subcriteria associations, which are not obvious from Figure 4.2. However, Table 4.1 does not show inter-relations between subcriteria, thus Figure 4.2 is a more accurate presentation of SISP reality. In Chapter 6, criteria and subcritaria interrelationships are discussed more critically through hypothesis testing.

Table 4.1 Control Hierarchy – Main Subcriteria Network

Effectiveness (ES)	Maneuverability (M)	Efficiency (EF)
Form & Content	Viability	Stakeholders' Designation
Collaboration	Time Dimension	Technology
Knowledge Bank	Knowledge Bank	Knowledge Bank
Policies	Policies	Policies

The following sections present a short definition for the subcriteria. Each subcriterion is defined for the highest level of SISP maturity. The definitions of these subcriteria are summaries of the SISP structure, discussed in Chapter 2, enhanced with a new approach to the SISP maturity definition.

4.5.1.1 Policies

Stevenson (1993) define a policy as a set of rules which managers use as a foundation for decision-making and Ward and Peppard (2002:358) as "statements of principles or actions defining acceptable behaviour". In the Steiner model of strategic planning (Mintzberg et al., 1998) policies sit higher than strategies, i.e. objectives and policies drive the formulation of strategies. This study considers a narrow aspect of this rather wide subject. The study assesses the SISP stakeholders 'perception' of policies established to disseminate the best practices and to provide directions to ensure SISP success. The degree of maturity of the planning process depends on the degree of acceptance and implementation of relevant standards, guidelines, and procedures defined by policies. Policies should be concise and easy to understand, they are also, implementable and enforceable. An effective policy has clear, measurable and appropriate ways of checking to see that the rules are being followed. Policies should establish the shared patterns of behaviour that underlie a culture of professionalism dedicated to continuous improvement. Advanced organisations establish and maintain a documented policy for conducting the planning review process and the plan process monitoring and improvement. Advanced organisations also, make easy to change policies as technology and needs change. Political, social and regulatory issues (external environment) are reflected in guidelines and procedures. Quality procedures are in place. The outcome of the SISP itself is more likely to be a set of polices rather than applications definitions (King, 1988; McBride, 1998), thus SISP disseminated policies would reflect the level of SISP maturity. The subdimensions and variables for SISP constructs are shown in Table 4.2.

Table 4.2 Policy Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Sub clusters	Nodes
Policies	1P General Policy	11P Promoting Policy	111P Ideas and Knowledge Sharing 112P Responsiveness to Environment 113P Cordial Relationships 114P Lowering Cultural Gaps 115P Cost Saving 116P Balanced Control with Spontaneity
		12P Formulation Studies Policy	121P Predictive Study 122P Feed forward Study 123P Feedback Study 124P Scenario Planning
		13P Methodology Policy	131P Formal Methodology 132P No Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	211P No Measurement 212P Formal Measurement
		22P Measurement Objectives Policy	221P Improve Control of IT Projects 222P Improve Estimation for Future Plans 223P Gain Top Management Support 224P Identify Best Practices
	3P Learning Policy	31P Change Reviews Policy	311P No Review 312P Quarterly Review 313P Once per Six Months Review 314P Once per Year Review 315P Once in 2 Years Review 316P Once in 3 Years Review 317P Continuos Change Reviews
		32P Learning Reviews Policy	321P Formal Learning Review 322P No Learning Review
	4P Environmental Policy	41P Environment Policy	411P Political System and Gov. Policies 412P World Economy 413P Social Issues 414P Legal Trends 415P Ecological Trends 416P Technological Barriers 417P Pressure Groups and stakeholders 418P Competitive Environment

4.5.1.2 Knowledge Bank

A knowledge bank is a primary asset of any organisation (Tiwana, 2002). Tiwana (2002:4) defined knowledge as 'a fluid mix of framed experience, values, contextual information, expert insight, and intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates in individual minds but is often embedded in organisational, routines, processes…'. Strategic visioning, ability to think strategically is what stands out and makes the difference. Such strategic orientation requires knowledge and experience. It can be suggested that technology itself cannot be competitive weapons without talented people. An early advantage of possessing the newest technology would quickly disappear and it is ultimately about the ways people use it. Thus, the quality of people (intellectual capital) involved in the SISP process in terms of the ability to think innovatively, having adequate skills, knowledge, and experience is a key contributor to SISP. People interaction, learning from experience and sharing knowledge are important attributes for this criterion. There are four types of knowledge inherent to SISP: IS/IT knowledge, business knowledge, organisation-specific knowledge and management competencies (Pai, 2006). To keep up with technological advances and rapidly changing business environments, SISP needs continues improving of strategic planning skills (Pervan, 1998).

'Shared domain knowledge and IT implementation success are expected to affect both the communication between IT and business executives and the connections between business and IT planning, which in turn will influence alignment' (Reich and Benbasat, 2003:269). Shared knowledge will not only influence the quality of the SISP content, but also the social dimension of SISP (alignment). Similar conclusions can be found in Pai's (2006) study where an empirical study of the relationship between knowledge sharing and SISP is described. The result of that study shows that knowledge sharing positively and significantly influences the effectiveness of SISP.

The assessment of the Knowledge Bank subcriteria is done by judgement of its importance with the respect to the main criteria. The hierarchical organization of all subdimensions is shown in Table 4.3.

Table 4.3 Knowledge Bank Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Knowledge Bank	1KB Available Skills	11KB Available Skills	111KB Business Analyst 112KB Database Administrator 113KB General IT Consultant 114KB Information Analyst 115KB Information Systems Planner 116KB IS Trainer 117KB Programmer 118KB Project Manager 119 KB Systems Analyst 1110KB Technical Systems Programmer 1111KB User Support 1112KB Network Manager
		12KB SISP Team Skills	121KB Adequate Project Management Skills 122KB Adequate Technical Skills 123KB Entrepreneurial marketing style 124KB Knowledge about Business Objectives 125KB Strategically Thinking Capability
	2KB Applied Knowledge	21KB Formulation Studies	211KB Feedback Study 212KB Feedforward Study 213KB Predictive Study 214KB Scenario Planning
		22KB Learning Reviews	221KB No Learning Review 222KB SISP Experience Shared
		23KB Experience with Measurement	231KB No Formal Measurement 232KB Only Financial Measurement 233KB Do not understand measurement theory 234KB Measurement not Reliable 235KB Satisfactory Measurement 236KB Automated tools used
		24KB Satisfaction with Methodology	241KB Not aware of different SISP method. 242KB SISP methodology contributed to failure 243KB Improving SISP methodology 244KB Chosen approach satisfactory
	3KB Source of Expertise	31KB Expertise	311KB Books or Periodicals 312KB Hardware and Software Vendors 313KB Consultants 314KB Internal Resources 315KB University Consultants
	4KB Organization Profile	41KB Main Focus	411KB Strategic decision making process 412KB Increase competitiveness 413KB Enhance efficiency of IT processes
		42KB Organization Profile	421KB High-Teck 422KB Innovation Driven 423KB Knowledge Intensive

Subcriteria	Cluster	Subclusters	Nodes
			424KB No electronic trade
	5KB Planning Level	51KB Link	511KB Partners 512KB Integrated 513KB Weak Link 514KB No Link
		52KB Level of Planning	521KB Address only technical issues 522KB Address socio technical issues 523KB IS Projects embedded in IS plan 524KB IT Projects embedded in business plan

4.5.1.3 Stakeholders' Designation

The extent to which powerful organisational actors are involved and committed to SISP throughout the planning cycle will increase the efficiency of SISP. The availability of resources involved in the SISP process is important. SISP team member selection, their credibility and competence, as well as clear delegation of responsibility have an impact on SISP success. Integration of inputs from all stakeholders should be an on going activity as their creative energy can help in generating more innovative strategies. Therefore, a participative SISP should enrich the SISP content (Ismail and Winder, 1996). As shown in Chapter 2, many studies categorise and characterise stakeholder groups for SISP. The study of Ruohonen (1991) is briefly mentioned in the literature review and here is presented in more details because of its use in Stakeholder's criteria assessment.

Ruohonen (1991) studied the relationships of managerial groups in Finland and identified and discussed the difference of three stakeholders groups: top management, user and IS/IT management group. He specified IS experience, contribution to SISP for each group and investigated inter-group and intra-group relationships. His study revealed that,

- *Top management group*: (1) usually does not have IS Experience (excluding end-user computing), and (2) contributes to SISP in organizational and strategy analysis, higher level control, Information Management and Strategy formulation.
- *User management group*: (1) usually does not have IS Experience or in a systems requirements phase (excluding end-user computing), and

(2) contributes to SISP in Strategy analysis, bottom-up needs, Information Systems Strategy formulation.

- *IS/IT management group*: (1) usually have experience in all traditional information systems development phases, and (2) contributes to SISP in Feasibility of IS requirements, IT architecture proposals, Information Technology Strategy formulation.

The sampled companies in that study demonstrated that "organizational planning and development are multifaceted, such that different organizational and political interest groups locate themselves to defend their positions and preferences."

Basu et al. (2002) warned that, while senior management involvement has a positive impact on SISP success, too much organisational commitment impedes SISP and may lead to detrimental effects of excessive planning.

This study assesses Stakeholders Designation through participation and commitment of available resources (Table 4.4).

Table 4.4 Stakeholders Designation Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Stakeholders Designation	1S Commitment	11S Commitment	111S CEO 112S CIO 113S Senior business management 114S Middle business management 115S IS Management
		12S SISP Initiators	121S Senior Business Management 122S Information Systems Management 123S Senior business and IS management together 124S IS Staff Planners 125S Users and IS management together 126S Users business and IS management coalition
	2S Participation	21S Top Management Role	211S Active Leadership 212S Champion 213S Not Involved 214S Sponsor 214S Supporting Role
		22S Participation in SISP	221S Chief Executive Officer 222S Chief Information Officer 223S Computer operations personnel 224S Consultant 225S IS Management 226S Middle business management 227S Senior business management 228S Stakeholders 229S Systems analysts and developers 2210S Users

Subcriteria	Cluster	Subclusters	Nodes
			2211S Vendors
	3S Resources	31S Available Skills	311S Business analyst 312S Database administrator 313S General IT consultant 314S Information analyst 315S Information systems planner 316S IS Trainer 317S Network manager 318S Programmer 319S Project manager 3110S Systems analyst 3111S Technical systems programmer 3112S User support
		32S Reasons for SISP	321S Competitive pressure 322S IT executive change 323S IT reorganization 324S Need to change production 325S SISP planning is continuos process

4.5.1.4 Technology

Technology is a very important asset that makes the planning process more efficient. The larger and more advanced the existing IS platform, the more effective the collection and synthesis of information needed by the actors involved in SISP planning (Sabherwal, 1999). Also, the greater integration of information and IT needs as part of planning and the greater monitoring of the implementation of long term plans in case of more extensive IT infrastructure capability is reported (Broadbent et al., 1999). It is reported that advanced technology has enabled the integration of IS and business strategies (Broadbent et al., 1999). Monitoring and feedback for SISP optimisation depends not only on human factors but on available technology. This is to distinguish technology as the focus of SISP and technology as an enabler for a more efficient planning process.

The maturity of this component can be assessed from different perspectives. Allen and Boynton (1991) identified two different approaches to specify selection of IS technology to achieve the goals of efficiency and flexibility. They called them the low road and the high road. Generally, the requirements for efficiency are met by high-road solutions (centralised technology), and flexibility is achieved by the low road (distributed technology).

Byrd et al. (1995) discussed the influence of technology/infrastructure on the quality of SISP. They argued that more mature technology will produce higher quality IT plans.

Table 4.5 shows the variables used in the Technology subcriteria assessment.

Table 4.5 Technology Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Technology	1T Applications	11T Organization Profile	111T High-Teck 112T Innovation Driven 113T Knowledge Intensive 114T No electronic trade
		12T Applications	121T Web based applications 122T Decision support applications 123T Nano technology or neural networking 124T Expert Systems 125T Voice recognition applications 126T Data warehousing 127T Traditional technology and applications 128T Security applications 129T Legacy applications are still in place 1210T Data Mining
	2T Infrastructure and Dependency on IT	21T Infrastructure	211T Infrastructure is integrated 212T Infrastructure is stand alone
		22T Dependency on IT and IS	221T IS distributed and not critical to business 222T IS distributed and critical to business 223T IS centralised and not critical to business 224T IS centralised and critical to business

4.5.1.5 Form & Content

IT/IS vision, mission, goals and objectives, selected themes and suggested strategies should reflect a thorough analysis of the internal and external environments. Suggested themes/projects are derived from business strategies or aligned with business goals. The focus is on trends, competitors, and achievement of competitive advantage and customer satisfaction. Attention to clarity of expression, comprehensiveness, and structure is very important. The IT Strategic plan model is developed and presented as framework to follow for the plan development process and content presentation. Key development programmes are identified. SISP is continuous and emerging and SISP review meetings result in updated documents with an accent on critical issues. Every identified issue should be addressed by goals, objectives, and strategies of how to achieve goals/objectives. The content of SISP, in general terms, addresses new and emerging technologies, information resource management, IT support services, strategic application systems, technical infrastructure, project management (approach, process and other strategic guidelines), risk management, IT human resource strategies, quality management of IT services, information sharing, and internal and external communication in the working environment (Earl, 1989; Smits, Poel and Ribbers, 2003). At all times the scope should be kept manageable. Structural and informal approach to planning should be balanced. Use of adequate methodologies and specific tools and techniques speedup the planning process, but there should be room for flexibility to allow for innovative ideas (Hartono et al., 2003).

The quality of IT plans is investigated as an independent and dependent variable (Byrd et al., 1995). SISP (as an independent variable) is assessed against the organisational performance (a dependent variable), and the comprehensiveness of SISP (a dependent variable) is assessed through level of attention to business and technological factors. Comprehensiveness is defined in prior literature as: 'The extent to which an organisation attempts to be exhaustive or inclusive in making and integrating strategic decisions', Fredrickson (1984:447). SISP comprehensiveness is reported to be both, positively and negatively related to SISP success. The relationship depends on 'a disturbance'; in a stable environment it is positive, and negative in an unstable environment (Fredrickson, 1984). Gottschalk (1999) investigated a relationship between the content of SISP and its implementation. He found a significant overall relationship, but none of the content characteristics were individually significant for SISP implementation (content characteristics listed in Table 0.1, Appendix A).

Thus, the Form & Content construct is investigated through the main dimensions: (1) Content and (2) Approach. The subdimensions and variables used for assessment of this construct are shown in Table 4.6.

Table 4.6 Form and Content Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Sub clusters	Nodes
Form and Content	1F Content	11F Main Focus	111F Enhance strategic decision making process 112F Increase competitiveness 113F Enhance efficiency of IT processes
		12F SISP Content	121F Addresses only technical issues 122F Addresses socio technical issues 123F IS Projects embedded in IS plan 124F IT Projects embedded in business plan
		13F SISP Formulation	131F Feed back study 132F Feed forward study 133F Predictive study 134F Scenarios study
		14F External Environment	141F Political system & government polices 142F World economy

Subcriteria	Cluster	Sub clusters	Nodes
			143F Social issues 144F Legal trends 145F Ecological trends 146F Technological barriers 147F Pressure groups & stakeholders 148F Companies competitive environment
		15F Focus of SISP objectives	151F Competitive advantage 152F Coordination 153F Create barriers 154F Enable existing business strategies 155F Establish electronic links 156F Improve customer satisfaction 157F Improve IS team performance 158F Leverage organization capabilities 159F Lower costs or product differentiation 1510F Provide database for decision making 1511F Acquire new technology
		16F Alignment	161F IS Plan aligned with Business Mission and Goals 162F IS Plan Supports Business Strategies
	2F SISP Approach	22F SISP Approach	221F No specific SISP approach or method 223F Specific Approach is used
		23F Methodology	231F Formal Methodology 232F No formal methodology

4.5.1.6 Collaboration

The alignment of the IS strategic plan with the business strategic plan, horizontal and vertical coordination, cooperation, and integration of all involved in the SISP process influence the effectiveness of the SISP process. Understanding and communicating the business and IT mission, vision and goals and objectives will lead to integrated or partnership relationships between IT and business and the strengths of the alignment between the business and IT planning will increase. The right motivations of all involved in the SISP process should exist to achieve strategic alignment. Also, the capability to communicate the values of SISP throughout the organisation brings credibility to SISP planners and ensures the support and success of the planning efforts by creating a less reactive climate. IS management should be a part of the corporate business planning process to facilitate alignment and improve communication. SISP is to have focus on strategic alliances on marketplace (horizontal integration), thus achieving cohesion between partner organisations to sustain competitive advantage, or achieving cohesion between position and capability (vertical integration). Thus, the level of coordination and cooperation among the functions affected by SISP reflects SISP maturity in an organisation.

The Collaboration construct is investigated through two main clusters: (1) Strategic Alignment and (2) Communication. The selected variables are shown in Table 4.7.

Table 4.7 Collaboration Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Collaboration	1C Alignment	11C Support for planning	111C IS Plan reflects the business plan mission 112C IS Plan reflects the business plan goals 113C IS Plan Supports Business Strategies
		12C Support for analysis	121C IS Plan selects a portfolio that maximizes total business value 122C IS plan recognizes external business environment forces 123C IS plan reflects the business plan resource constraints
		13C Support for action	131C Business plan refers to the IS plan 132C Business plan refers to value creation potential of information 133C Business plan contains reasonable expectations of IS
		14 C Link	141C No Link 142C Weak Link 143C Integrated 144C Partners 145C Vertical Links 146C Horizontal Links
		15C Measurement Objectives	151C Communicate best practices
	2C Communication	21C Communication	211C IT perceived as value adding to business 212C IT perceived as business enabler 213C IT perceived as business driver
		22C Focus of SISP objectives	221C Coordination with other functions 222C Establish electronic links 223C Improve IS team performance

4.5.1.7 Viability

Viability is associated with ‘capacity for survival’. Thus, flexibility, adaptability, and optimisation as the main attributes of viability are achieved through continuous monitoring and feedback/feedfoward control. The scope of the planning effort is strategic but manageable, and realistic. As a measurement plays an important role, the scope, attributes, and scale of SISP measurement during formation and formulation are clearly defined and in place. The external and internal environments are constantly scanned to determine the degree of influence on IT/IS infrastructure/applications to carry out core operations. Risks are fully investigated, and alternatives are identified through multiple scenarios planning. Scenarios are 'a structured way to define possible futures, understand chain for possible future, and develop options to deal with the uncertainties' (Boar, 1993:155). Thus scenario planning improves the manoeuvrability dimension of SISP and prepares the firm to react and take advantage of environmental changes (Teo and Ang, 2001). The effects of 'missed opportunities' are analysed and benefits of doing SISP are clearly expressed.

Table 4.8 shows the clusters and variables used for the assessment of Viability subcriteria.

Table 4.8 Viability Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Viability	1V Policy	11V Promoting Policy	111V Responsiveness to environment
		12V SISP Link	121V No Link 122V Weak Link 123V Integrated 124V Partners 125V Vertical Links 126V Horizontal Links
		13V Change Reviews Policy	131V No review 132V Quarterly review 133V Once per six months review 134V Once per year review 135V Once in 2 years review 136V Once in 3 years review 137V Continuos change reviews
		14V Environment Policy	141V Political system and government policies 142V World economy 143V Social issues 144V Legal trends 145V Ecological trends 146V Technological barriers 147V Pressure groups and stakeholders 148V Competitive environment
	2V Content	21V Formulation Studies	211V Predictive study 212V Scenario Planning
	3V Measurement	31V SISP Measurement Policy	311V No measurement 312V Formal measurement
		32V Measurement Timing	321V Against current reviewed objectives 322V Before during and after finish of IS project 323V Before IS project starts 324V In post implementation phase 325V Only against original objectives 326V Only for strategic projects 327V Used for all projects

Subcriteria	Cluster	Subclusters	Nodes
		33V Scope and Scale of Measurement	331V No formal documents for measurement 332V Problem with non financial measurement 333V Problem in understanding measurement theory 334V No reliable measurement results 335V Successful measurement theory and practice 336V Automation tools for metrics
		34V What is Measured	341V Business value delivered 342V Cost of measurement 343V Cost per unit 344V Customer satisfaction 345V Duration of SISP processes 346V Individual Performance 347V Investment costs 348V IT department performance 349V Value of lost or gained opportunity 3410V Quality of deliverables 3411V SISP formulation efficiency 3412V SISP implementation efficiency
		35V Measurement Objectives	351V Improve control of IS projects 352V Estimate for future plans 353V Top management support 354V Best practices

4.5.1.8 Time Dimension

The planning cycle and planning horizon determine the time dimension of SISP. Planning horizons can take from one to 5 years (Premkumar & King, 1991). A short planning cycle produces a greater responsiveness than a long planning cycle. Rapid and dynamic approaches to SISP are more appropriate for unstable environments. Dynamic synchronisation with business needs and adaptation to environmental changes require continuous planning review. Also, an organisation will tend to analyse in great details the internal and external environments and will consider more options when planning for a longer period (Chi et. al., 2005). The planning time horizon influences the scope of planning and planning priorities (Premkumar and King, 1994).

Inappropriate planning horizons have detrimental effects on SISP (Ledere & Sethi, 1996). The traditional long range strategic planning (5 or more years) is not sustainable and contemporary (short range 2-3 years) SISP must be strategic enough and distinguishable from tactical planning. Also, it is important that the SISP process is completed quickly, to be able to produce a plan before the requirements change (Basu et al., 2002). The Time Dimension subcriteria are assessed through time related variables as shown in Table 4.9.

Table 4.9 Time Dimension Subcriteria: Hierarchical Organization

Subcriteria	Cluster	Subclusters	Nodes
Time Dimension	1TD SISP horizon	11TD Level of SISP	11TD One year formal SISP plan 12TD Three year formal SISP plan 13TD Five year formal SISP plan
	2TD Change Reviews	21TD Change Reviews Frequency	21TD No review 22TD Quarterly review 23TD Once per six months review 24TD Once per year review 25TD Once in 2 years review 26TD Once in 3 years review 27TD Continuos change reviews
	3TD SISP Measurement	31TD SISP Measurement frequency	311TD Against current reviewed objectives 312TD Before during and after IS project 313TD Before the IS project starts 314TD In post implementation phase 315TD Only against original objectives 316TD Only for strategic projects 317TD Used for all projects

4.6 SISP Maturity Assessment Evaluation Clusters and Nodes

The task to identify observable variables for the subcriteria with sound theoretical and practical values was a big challenge. An even bigger challenge was to process a large number of variables. The cluster/subcluster/node membership for subcriteria (Form and Content, Collaboration, Policies, Stakeholders' Designation, Knowledge Bank, Technology, Time Dimension, and Viability) are organised as shown in Table 4.2 to Table 4.9. However, the dependencies between clusters belonging to each subcriterion cannot be seen from these tables. The relationships between the clusters for each controlling subcriterion are shown in Figure 4.3 to Figure 4.10.

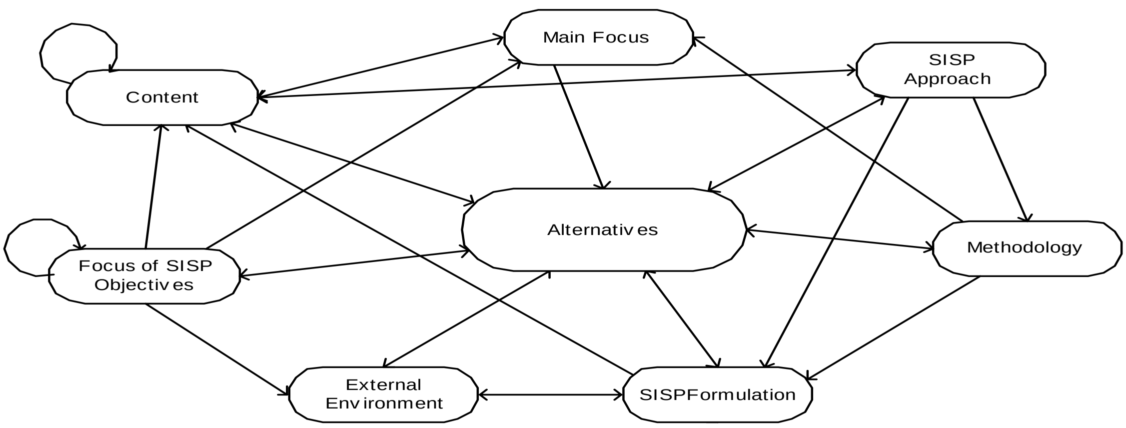


Figure 4.3 Form and Content: Feedback Network of Inter-correlated Clusters

To comply with the ANP/AHP software rules, each bottom level subnetwork has to have one cluster called '*Alternatives'.* The study specifies five nodes for this cluster. Each node is one of the five stages of SISP maturity (Rudimentary, Ineffectual, Attainable, Sustainable, and Adaptable Planning).

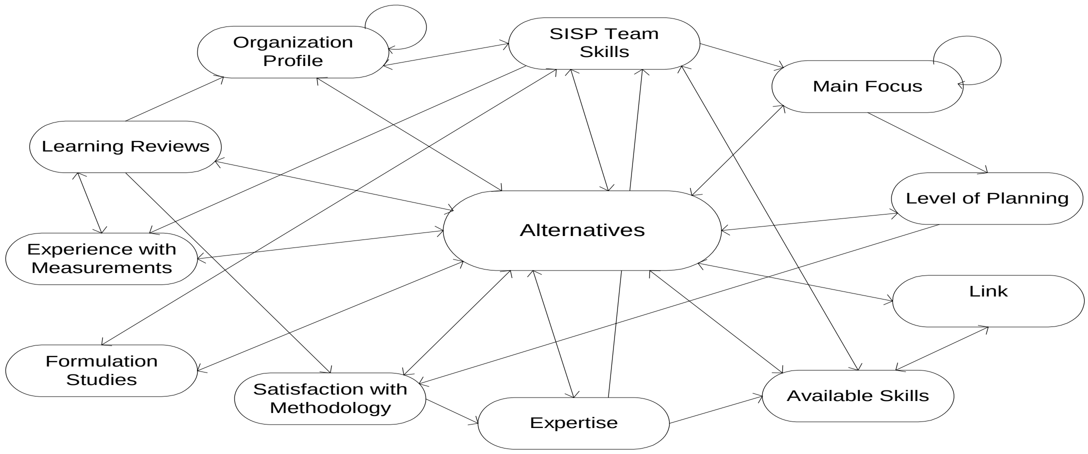


Figure 4.4 Knowledge Bank: Network of Inter-correlated Clusters

Dependence can occur within and between clusters. According to ANP/AHP nomenclature, clusters with loops that connect them to themselves are known as *inner dependent* clusters such as Content and Focus of SISP Objectives (Figure 4.3). All other connections represent the dependence between clusters which are known to be *outer dependent* (Saaty, 2001a).

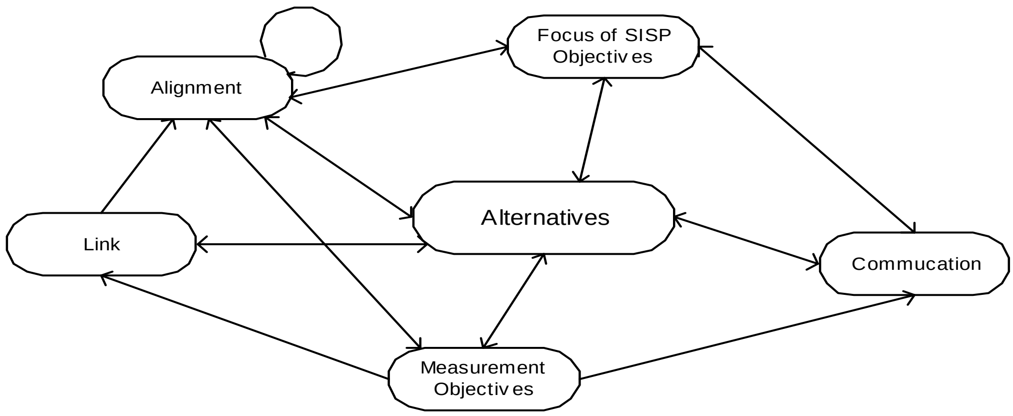


Figure 4.5 Collaboration: Network of Inter-correlated Clusters

A cluster is a selection of nodes (elements) whose function derives from the synergy of their interaction and hence has a higher order function not found in any single element (Saaty, 2001a). It is important to note that different nodes are used to model different stages of SISP maturity. This is done according to the literature review and the model definition in this Chapter. The selection nodes for each stage of SISP maturity is shown in Table 0.2 to Table 0.6 (Appendix B).

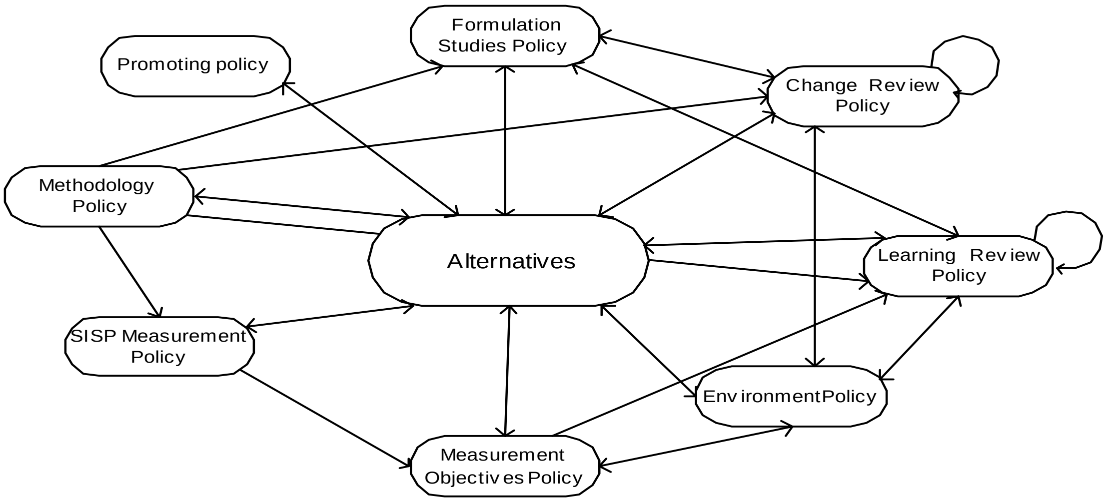


Figure 4.6 Policy: Network of Inter-correlated Clusters

Nodes (variables) are used for the production of a measuring instrument (shown in Appendix C). The final measuring instrument has additional questions related to the secondary research questions. A complete list of all variables and sources used for their compilation and judgements of their importance is shown in Table 0.1 (Appendix B).

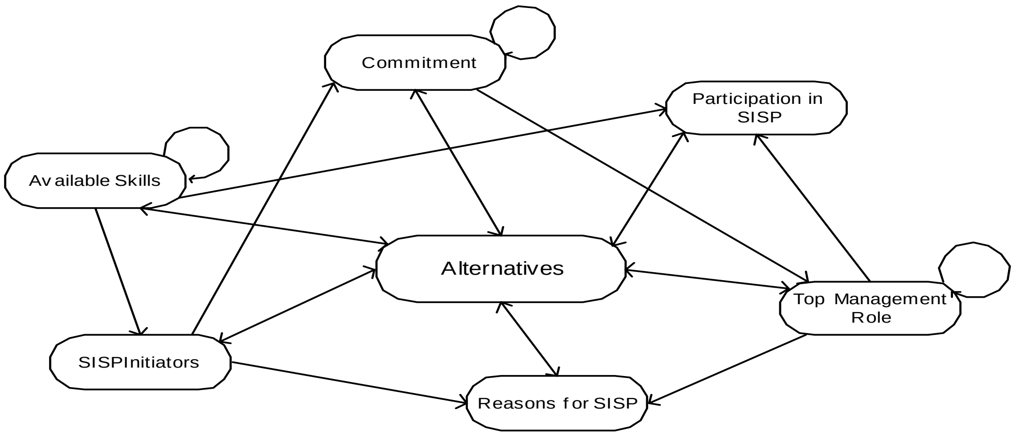


Figure 4.7 Stakeholders' Designation: Network of Inter-correlated Clusters

To improve the consistency of judgements, the clusters/nodes whose consistency ratios (C.R.) are not acceptable or their weights are insignificant are eliminated. Hence, somewhat the number of cluster nodes is reduced, i.e. the number of nodes in Table 0.1, Appendix B is different to that shown in Table 4.2 to Table 4.9.

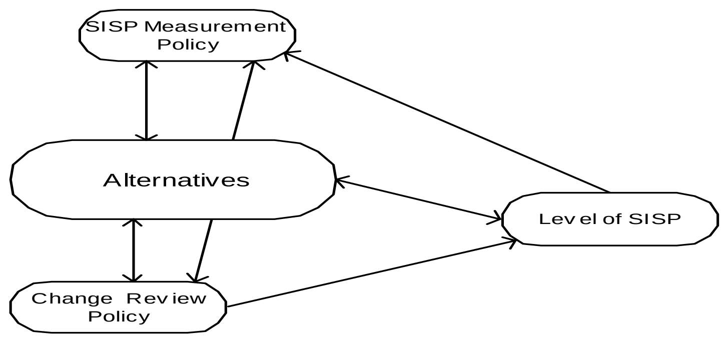


Figure 4.8 Time Dimension: Network of Inter-correlated Clusters

Node reduction was done only where it was evident that the variables do not add value to the SISP maturity assessment. An example of this simplification is the question about methodologies and techniques used to undertake SISP. For the purpose of this study, the literature supports the view that the success of SISP does not depend on the particular methodology/technique (usually multiple methodologies/techniques are used).

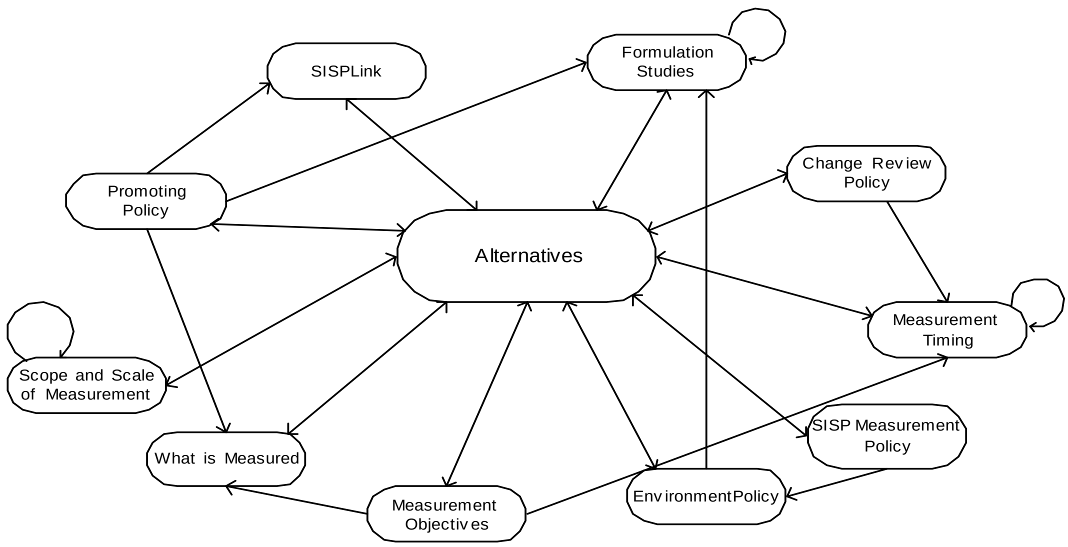


Figure 4.9 Viability: Network of Inter-correlated Clusters

Certainly, the literature confirms that the presence of methodology/techniques is vital, therefore it was only tested whether the methodology was used or not and the importance of existence of methodology weighted for the different stages of SISP maturity. As was said, the study will later investigate which methodology or technique is most used.

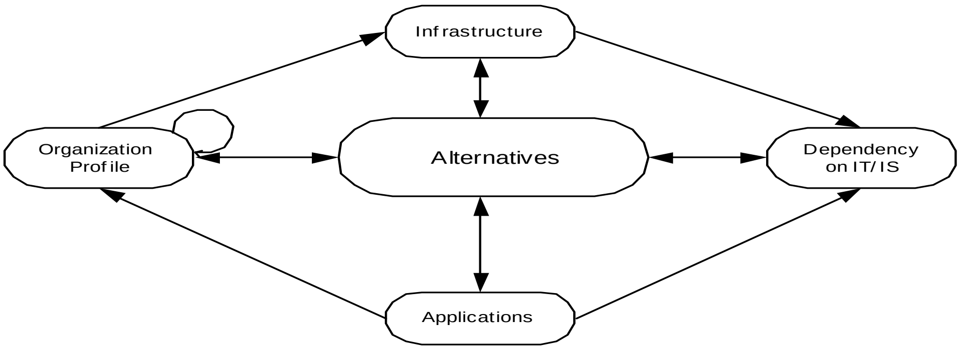


Figure 4.10 Technology: Network of Inter-correlated Clusters

4.7 Criteria Priorities

As was previously defined, the baseline criteria for SISP assessment were established as Efficiency, Effectiveness, and Manoeuvrability. They represent the top-level control hierarchy. A pairwise comparison of the SISP criteria to derive their priorities is not a straight forward task. As was demonstrated in Chapter 2, the literature review showed that views on many SISP issues are driven by the perceptions of participants at a specific point in time (eighties, nineties or recent years); they are country dependent, and the type and size of organisation have an impact. Furthermore, the perceptions of some practitioners and theorists may not be accurate or can have quite 'unique' research results. As an example, the research conclusion of Basu et al. (2002) stated that excessive organisational commitment to SISP can be detrimental and team involvement have no impact on SISP success. Also according to Gottschalk (1998), management support is not so important. Contradictory, McBride (1998), Earl (1993) and many other researchers stated that SISP depends on the extent to which powerful organisational actors are committed and involved and that the planning team (include both user managers and information systems professionals) plays a very important role. In similar situations, this research adopts the opinion which has greater support in the literature. Also, this study acknowledges the importance of reviewing the lessons of history, but the potential danger of accepting outdated 'assumptions' is still present.

4.7.1 Main Criteria Priorities

To find out the relative importance of the main criteria with respect to the overall goal of achieving SISP success, the following questions should be asked: of the two criteria being pairwise compared (Effectiveness and Efficiency; Effectiveness and

Manoeuvrability; Efficiency and Manoeuvrability) which is considered more important by SISP theorists and practitioners, and how much more important is it with respect to satisfaction with SISP maturity goal (SISP success).

To find answer to these questions the results of the SISP literature were consulted (Chapter 2). However, Chapter 2 reported the summary of the main findings, and this section adds more details where necessary. The literature is mainly concerned with the attributes of strategic information systems, plan and strategy process in general terms. The importance of effectiveness, efficiency and manoeuvrability is judged against their explicit definitions and against the subcriteria using sources as indicated in Table 0.1, Appendix B. Very often, efficiency and effectiveness are related to the operational efficiency or management effectiveness (Ward & Peppard, 2002; Collins and McLaughlin, 1998). “Both issues are important, but effectiveness is critical” according to Collins and McLaughlin (1998:633). However, there are implicit and explicit references to the importance of effective IS/IT strategy formulation and formation and the importance of the actual content of the strategy (Ward & Peppard, 2002). Ward & Griffiths (1998) presents the findings of the Galliers’ survey on the focus of IS planning as: 6% competitiveness, 78% effectiveness, 59% efficiency (23% exclusive focus on efficiency). Pisello (2001) stated that contributors to profitability are: Competitive Advantage/Market Position 65%, Strategic Moves 10%, Operating Efficiency 15%, Random Events - Luck 10%.

If these findings are translated in SISP terms (we are planning to increase the profitability) one can say that effectiveness (as per adopted definition) is at least 3 to 4 times more important than efficiency (from the scale 1 to 9). This statement has wide support in the SISP literature. For example, Flavel and Williams (1996) put effectiveness in front of efficiency (effectiveness is concerned whether the strategy will work where as efficiency is concerned with what the strategy will cost). Peter F. Drucker said that efficiency is doing better what is already being done; doing things right, and effectiveness is doing the right things.

The SISP process can be very efficient (finished on time, used right methodology, resources etc) but if the delivered content cannot contribute to change, expansion and growth, efficiency will have a small impact. A number of studies indicate that it is not cost savings and operational efficiency that deliver results. Strategic positioning and sustainable competitive advantage achieved by technology are vital components in achieving corporate goals, but still many plans have an accent on efficiency. On the other hand, if the planning exercise takes too long, a plan could be outdated before its implementation (Basu et al., 2002).

Recent research is unanimous in admitting the increased importance of capturing environmental dynamics in SISP. Mintzberg et al. (1998) point to an important aspect of strategy, the ability to 'manoeuvre', outwit an opponent or competitor. Scenario planning and contingency planning are essential for the strategic dimension of the IS plan. Judging by how often attributes of the dynamic dimension are discussed in the recent literature (Boar, 1993, Reich & Benbasat, 2003, Galliers, 1991, Willcocks, 2000, McBride, 1998) and judging by the importance given to this subject, the study concludes that 'manoeuvrability' is more important than efficiency.

The study concludes that successful SISP must possess all three attributes and that a delicate balance between them can enhance SISP. In that sense, effectiveness is moderate important than efficiency and it is between equal and moderate important to manoeuvrability; at same time manoeuvrability is moderate important than efficiency.

The following is a simple demonstration how this judgement is operationalised for use by ANP. A paired comparison of the main criteria with respect to the goal of having successful SISP is conducted (as described above). Priority judgements are derived and shown in Table 4.10. This table indicates the dominance of the factors listed in the rows over the factors listed in the columns using judgements on a scale 1 to 9 (i.e. 1 is equal importance, 2 is between equal and moderate, 3 is moderate importance, 4 is moderate plus, etc., refer to Table 3.2).

Table 4.10 Pairwise Comparison Matrix for the Main Criteria

	Effectiveness	Efficiency	Manoeuvrability	Priority Vector
Effectiveness	1	3	2	0.528
Efficiency	1/3	1	1/3	0.140
Manoeuvrability	½	3	1	0.333

Inconsistency = 0.05

This example will demonstrate the technical aspects of deriving the priorities and assessing their consistency. According to AHP theory, the vector of priorities has to be derived from the reciprocal matrix of comparisons. The solution (priority vector) is obtained by raising the matrix to a sufficiently large power, then summing over the rows and normalizing (dividing each row sum by the total). In this case, supermatrix W is calculated as shown below:

$$W = \begin{vmatrix} 1 & 3 & 2 \\ 0.33 & 1 & 0.333 \\ 0.5 & 3 & 1 \end{vmatrix} \bullet \begin{vmatrix} 1 & 3 & 2 \\ 0.33 & 1 & 0.333 \\ 0.5 & 3 & 1 \end{vmatrix} = \begin{vmatrix} 1\bullet1+3\bullet0.33+2\bullet0.5 & 1\bullet3+3\bullet1+2\bullet3 & 1\bullet2+3\bullet0.333+2\bullet1 \\ 0.33\bullet1+1\bullet0.333+0.333\bullet0.5 & 0.333\bullet3+1\bullet1+0.33\bullet3 & 0.333\bullet2+1\bullet0.333+0.333\bullet1 \\ 0.5\bullet1+3\bullet0.333+1\bullet0.5 & 0.5\bullet3+3\bullet1+1\bullet3 & 0.5\bullet2+3\bullet0.333+1\bullet1 \end{vmatrix}$$

$$W = \begin{vmatrix} 3 & 12 & 5 \\ 0.833 & 3 & 1.333 \\ 2 & 7.5 & 3 \end{vmatrix} = \begin{vmatrix} 20/37.666 \\ 5.166/37.666 \\ 12.5/37.666 \end{vmatrix} = \begin{vmatrix} 0.530 \\ 0.137 \\ 0.332 \end{vmatrix}$$

The value of the priority vector shown in Table 4.10 is produced by the software package ‘Super Decisions’. The value obtained by manual calculations shows that raising the matrix to the power of 2 is already an acceptable approximation.

4.7.2 Subcriteria Priorities

The subcriteria were identified as: Form and Content, Collaboration, Policies, Stakeholders’ Designation, Knowledge Bank, Technology, Time Dimension, and Viability.

The influence of the main criteria - effectiveness, efficiency, and manoeuvrability on the subcriteria is defined by a pairwise comparison of subcriteria with regard to each control criteria. The dependency among subcriteria is tackled through the pairwise comparisons of the subcriteria among themselves in respect to the control criteria. The priorities obtained are shown in Table 4.11.

Table 4.11 Pairwise Comparison Matrix for the Subcriteria

	Priority Vector
Form and Content	0.075465
Collaboration	0.161996
Policies	0.0902800
Stakeholders’ Designation	0.186721
Knowledge Bank	.219168
Technology	0.080473
Time Dimension	0.072635
Viability	0.113263

The low score of Form and Content at a first glance was not what was expected. The judgements were rechecked and found to be appropriate. It was found that all other subcriteria should be more influential to prevent the plan to ‘collect dust on the shelf’. The high score of Knowledge Bank was expected as all other dimensions depend on available knowledge and skills.

In addition to above specified subcriteria, the cluster called the Worth of SISP was defined. This cluster is influenced only by the main criteria. This cluster is an overall reflection of how SISP is doing; it could be taken from the model as a fine grade of influencing factors spread across the other subcriteria.

The priorities given to the subcriteria with the respect to the main criteria are shown in Table 4.12. These priorities were used to weight the corresponding blocks of the supermatrix. This matrix is raised to limiting powers and then normalised (as described in Chapter 3), yielding results as shown in Table 4.13.

Table 4.12 SISP Supermatrix of Weighted Priorities

	Effectivenes	Policies	Efficiency	Knowledge	Manoeuvrability	S. Designatio	Technology	Form & Content	Collaboration	Time	Viability	Goal
Effectiveness	0	0	0	0	0	0	0	0	0	0	0	0.528
Policies	0.080743	0	0.047397	0.12079	0.036279	0.107978	0.052833	0.103366	0.084652	0.17	0.04685	0
Efficiency	0	0	0	0	0	0	0	0	0	0	0	0.14
Knowledge Bank	0.212358	0.33173	0.124269	0	0.155662	0.361492	0.29839	0.359125	0.190282	0.12	0.27179	0
Manoeuvrability	0	0	0	0	0	0	0	0	0	0	0	0.333
Stkhlders Designati	0.11495	0.22486	0.132321	0.296918	0.060406	0	0.226803	0.052578	0.285512	0.33	0.08079	0
Technology	0	0.03731	0.146916	0.042222	0.103396	0.040792	0	0.078932	0.151308	0.1	0.19754	0
Form & Content	0.158132	0.07893	0.036533	0.092685	0.049733	0.084822	0.084829	0	0.054138	0.06	0.10861	0
Collaboration	0.075082	0.16824	0.070623	0.231816	0.066892	0.208239	0.162668	0.203659	0	0.14	0.16183	0
Time Dimension	0	0.04898	0.123038	0.059268	0.090257	0.054672	0.059259	0.058865	0.128317	0	0.13258	0
Viability	0	0.10996	0.064183	0.1563	0.182747	0.142006	0.115217	0.143474	0.105791	0.07	0	0
Goal	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.13 SISP Limit Supermatrix – Normalised Column in Each Block

	Effectiveness	Policies	Efficiency	Knowledge	Manoeuvrability	S. Designatio	Technology	Form & Content	Collaboration	Time	Viability	Goal
Effectiveness	0	0	0	0	0	0	0	0	0	0	0	0
Policies	0.09028	0.09028	0.09028	0.09028	0.09028	0.09028	0.09028	0.09028	0.09028	0.09	0.09028	0.09
Efficiency	0	0	0	0	0	0	0	0	0	0	0	0
Knowledge Bank	0.219167	0.21917	0.219167	0.219167	0.219167	0.219167	0.219167	0.219167	0.219167	0.219	0.21917	0.219
Manoeuvrability	0	0	0	0	0	0	0	0	0	0	0	0
Stkhlders Designatio	0.186721	0.18672	0.186721	0.186721	0.186721	0.186721	0.186721	0.186721	0.186721	0.187	0.18672	0.187
Technology	0.080473	0.08047	0.080473	0.080473	0.080473	0.080473	0.080473	0.080473	0.080473	0.08	0.08047	0.08
Form & Content	0.075464	0.07546	0.075464	0.075464	0.075464	0.075464	0.075464	0.075464	0.075464	0.075	0.07546	0.075
Collaboration	0.161997	0.162	0.161997	0.161997	0.161997	0.161997	0.161997	0.161997	0.161997	0.162	0.162	0.162
Time Dimension	0.072634	0.07263	0.072634	0.072634	0.072634	0.072634	0.072634	0.072634	0.072634	0.073	0.07263	0.073
Viability	0.113264	0.11326	0.113264	0.113264	0.113264	0.113264	0.113264	0.113264	0.113264	0.113	0.11326	0.113
Goal	0	0	0	0	0	0	0	0	0	0	0	0

4.8 The Clusters and Nodes Priorities

Cluster memberships organised with respect to the main criteria (Effectiveness, Efficiency and Manoeuvrability) are shown in Table 4.14, Table 4.15 and Table 4.16.

Table 4.14 Cluster Membership for Effectiveness Control Criterion

Effectiveness Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
SISP Approach and Methodology Used	McBride (1998) Doherty et al. (1999) Earl (1989, 1993, 2000) Ward & Griffiths (1998) Lederer & Sethi (1988) Flynn & Goleniewska (1993) Segars et al. (1998) Willcocks (2000) Salmela et al. (2000) Hartono et al. (2003) Sullivan (1985) Boyton & Zmud (1987) Cerpa & Verner (1998) Andrews & Stalick (1994) Palanisamy (2005) Remenyi (1991) Hagmann & McCahon (1993)
Extent of alignment of information system planning and business planning	Kearns & Lederer (2000) Spremic & Strugar (2002) Teo & King (1996) Reich & Benbasat (2003) Sabherwal, Hirschheim & Goles (2003) Smits et al. (2003) Earl (2000) Willcocks (2000) Flynn & Goleniewska (1993) Ward & Peppard (2002) Cerpa & Verner (1998) Mintzberg et.al. (1998) Chan & Huff (1993) Galliers (1987)

Effectiveness Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
Level of SISP planning	Somogyi & Galliers (2003) Spremic & Strugar (2002) Smits et al. (2003) Palvia & Palvia (2003) Segars & Grover (1998) Finlay & Marples (2000) Nolan (1979)
Extent of participation in SISP	Teo et al. (1997) Hartono et al. (2003) Basu et al. (2002) Jiang et al. (2001) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Lambert & Peppard (2003) Gottschalk (1998) Flynn & Goleniewska (1993) Ruohonen (1991) Mitchell et al. (1997)
Sources for the expertise for SISP	Teo et al. (1997) Hartono et al. (2003) Markus & Benjamin (2003) Palvia & Palvia (2003) Lederer & Sethi (1996) Lambert & Peppard (2003)
SISP formulation studies undertaken	Powell & Powell (2004) Hartono et al. (2003) Spremic & Strugar (2002) Lederer & Salmela (1996) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993)
Experience with learning reviews	Hartono et al. (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Lambert & Peppard (2003)

Effectiveness Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
	Boar (2001)
Reasons for SISP planning/review	Willcocks (2000) Earl (2000) Flynn & Goleniewska (1993) Das et al. (1991) Boar (2001)
Importance of SISP objectives	Basu et al. (2002) Hartono et al. (2003) Palvia & Palvia (2003) Earl (2000) Willcocks (2000) Flynn & Goleniewska (1993)
SISP promoting policy	Hartono et al. (2003) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Reich & Benbasat (2003) Leidner (2003) Flynn & Goleniewska (1993)
Main focus of SISP planning	Wilson (1989) Segars et al. (1998) Hartono et. al. (2003) Earl (2000) Willcocks (2000) Reich & Benbasat (2003) Lambert & Peppard (2003) Flynn & Goleniewska (1993)
Benefits of the SISP	Kearns & Lederer (2000) Cerpa & Verner (1998) Teo et al. (1997) Palvia & Palvia (2003) Lederer & Sethi (1996) Wilson (1989)
Extent of accomplishment and sustainability of measurement objectives	Palvia & Palvia (2003) Willcocks (2000)
IS staff or skills available regardless of whether employed or contracted	Finlay & Marples (2000) Lederer & Salmela (1996)

These tables show the sources used to judge the importance of the nodes and their interactions. There are about 400 of nodes (elements) in all subnets. To prioritise the nodes, the following generic question is to be asked: for a given subcriterion, a node of the network and given a pair of nodes, how much more does a given member of the pair influence that node with respect to the subcriterion than the other member?

Table 4.15 Cluster Membership for Efficiency Control Criterion

Efficiency Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
Methodologies and techniques used in conjunction with the chosen approach	McBride (1998) Doherty et al. (1999) Ward & Griffiths (1998) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Segars & Grover (1998) Flynn & Goleniewska (1993)
Skills of participants who play the major roles in SISP	Finlay & Marples (2000) Hartono et al. (2003) Basu et al. (2002) Lederer & Sethi (1996) Lambert & Peppard (2003) Flynn & Goleniewska (1993)
Degree of dependency on IT/IS	Ward & Griffiths (1998) Allen & Boynton (1991) Boar (2001)
Satisfaction with chosen methodology (techniques)	Hartono et al. (2003) Lederer & Sethi (1992) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993)
Person(s) who initiated strategic IS planning	Teo et al. (1997) Galliers & Leidner 2003 Spremic & Strugar (2002) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Lambert & Peppard (2003) Flynn & Goleniewska (1993)

Efficiency Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
	Finlay & Marples (2000) Galliers (1991) Ruohonen (1991) Mitchell et al. (1997)
Degree of commitment toward the SISP formulation	Galliers & Leidner (2003) Basu et al. (2002) Jiang et al. (2001) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Galliers (1991) Lambert & Peppard (2003) Gottschalk (1998) Flynn & Goleniewska (1993) Ruohonen (1991)
Link between IS/IT planning and business planning	Palvia & Palvia (2003) Tanaszi (2002) Willcocks (2000) Lambert & Peppard (2003) Teo & King (1996) Flynn & Goleniewska (1993)
Measurement of achievement of SISP formulation and implementation objectives	Hartono et. al. (2003) Palvia & Palvia (2003) Willcocks (2000)
Timing of measurement of SISP success/failure objectives	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003)
Experience with measurement	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Mintzberg et.al.(1998)
Benefits of SISP	Kearns & Lederer (2000) Cerpa & Verner (1998) Teo et al. (1997) Palvia & Palvia (2003) Lederer & Sethi (1996) Wilson (1989)
What is measured during preparation or implementation of SISP	Hartono et al. (2003)

Efficiency Criterion Clusters	Primary Sources (to compile the nodes and/or to judge the importance of the nodes)
	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Fitzgerald (1993) Boar (2001) Wexelblat &Srinivasan (1999)
Measurement objectives	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Ward & Peppard (2002)
Extent of accomplishment and sustainability of measurement objectives	Palvia & Palvia (2003) Willcocks (2000)
Organization profile	Andersen (2001) Ward & Peppard (2002)
IT/IS infrastructure/applications in place	Andersen (2001) Palvia & Palvia (2003) Willcocks (2000) Cerpa & Verner (1998)
Degree of dependency on IT/IS infrastructure/applications to carry out core operation and manage business	Ward & Peppard (2002) Andersen (2001) Mintzberg et al.(1998) Allen & Boynton (1991)
IS staff or skills available regardless of whether employed or contracted	Finlay & Marples (2000) Lederer & Salmela (1996)

A pairwise comparison of nodes is done with respect to the five SISP maturity nodes within the 'Alternative' cluster. The SISP maturity nodes (alternatives) are not prioritised among themselves. Instead, their priorities are derived (synthesised) from the influence of all clusters and nodes with respect to the criteria and subcriteria.

Table 4.16 Cluster Membership for Maneuverability Control Criterion

Manoeuvrability Criterion Clusters	Primary Sources (to compile the nodes and/or to judge the importance of the nodes)
SISP formulation undertaken studies	Powell & Powell (2004) Somogyi & Galliers (2003) Hartono et al. (2003) Spremic & Strugar (2002)

Manoeuvrability Criterion Clusters	**Primary Sources** (to compile the nodes and/or to judge the importance of the nodes)
	Lederer & Salmela (1996) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993)
SISP implementation change reviews policy	Hartono et al. (2003) Earl (1993) Palvia & Palvia (2003) Willcocks (2000) Flynn & Goleniewska (1993) Das et al. (1991)
External environment factors addressed in SISP	Hartono et al. (2003) Lederer & Salmela (1996) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993) Ward & Peppard (2002) Chi et al. (2005)
Extent of accomplishment and sustainability of SISP objectives	Wilson (1989) Earl (1993) Flynn & Goleniewska (1993) Cerpa & Verner (1998)
Benefits of the SISP	Kearns & Lederer (2000) Cerpa & Verner (1998) Teo et al. (1997) Palvia & Palvia (2003) Lederer & Sethi (1996) Wilson (1989)
What is measured during preparation or implementation of SISP	Hartono et al. (2003) Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Fitzgerald (1993) Boar (2001)
Extent of accomplishment and sustainability of measurement objectives	Palvia & Palvia (2003) Willcocks (2000)

Manoeuvrability Criterion Clusters	Primary Sources (to compile the nodes and/or to judge the importance of the nodes)
IT/IS infrastructure/applications in place	Andersen (2001) Palvia & Palvia (2003) Willcocks (2000) Cerpa & Verner (1998)
IS staff or skills available regardless of whether employed or contracted	Finlay & Marples (2000) Lederer & Salmela (1996)

An example of the pairwise comparison of nodes belonging to the cluster 'Formulation Studies Policy' against the 'Adaptable planning' node (belonging to the 'Alternatives' cluster) is shown Table 4.17. For this exercise, the clusters involved are defined as:

- Predictive study (what may affect the IS/IT function in the future and how the IS/IT function can respond to different proposed systems)
- Feedforward study (analysis of all important existing components such as hardware, software, resources, etc. which could be useful for a proposed new system)
- Feedback study (analysis of existing components such as hardware, software, resources, etc. which must change/replace)
- Scenario planning (tool-based, qualitative and quantitative analysis to understand the consequences of a wide range of possible changes)

The judgement of these nodes is shown in Table 4.17 and was derived by asking the questions like: for the given 'Policy' subcriterion, the given Adaptable Planning node and given a pair of nodes being 'Feedback Study' and 'Scenario Planning' how much 'Scenario Planning' is more important for Adaptable Planning with respect to the 'Policy' subcriterion than 'Feedback Study'.

Table 4.17 Pairwise Comparison Matrix for the 'Formulation Study' Subcluster

	Feedback study	Feedforward Study	Predictive Study	Predictive Study
Feedback study	1.00000	1.00000	0.20000	0.14286
Feedforward Study	1.00000	1.00000	0.14286	0.14286
Predictive Study	5.00000	7.00000	1.00000	5.00000

	Feedback study	Feedforward Study	Predictive Study	Predictive Study
Scenario Analysis	7.00000	7.00000	0.20000	1.00000

The derived priorities from above example are shown in Table 4.18.

Table 4.18 Node Priorities: 'Formulation Study' Subcluster with Respect to Adaptable Planning

	Priorities
Feedback study	0.129052
Feedforward Study	0.119850
Predictive Study	0.651542
Scenario Analysis	1.00000

The inconsistency index is 0.0170. It is desirable to have a value off less than 0.1.

The overall synthesis for the Policy subnetwork shows how are alternatives fed up through the system to produce the synthesized values (Table 4.20). Also, the same table shows the synthesis of the priorities for all other networks. The Normal column presents the results in the form of priorities which are normalised for each cluster. This is the usual way to report the results, but because of use of the benchmarking philosophy, it is more appropriate for this study to the use and report Ideal values. The Ideal column is obtained from the Normal (or Total) column by dividing each of its entries by the largest value in the column. The Total column is a raw column read directly from the Limit Supermatrix (Saaty, 2003).

Table 4.19 Ranking of Alternatives for all Subnetworks

Network	Alternatives	Total	Normal	Ideal	Ranking
Policies	Rudimentary Planning	0.0048	0.0100	0.0154	5
	Ineffectual Planning	0.0080	0.0166	0.0256	4
	Attainable Planning	0.0366	0.0756	0.1166	3
	Sustainable planning	0.1207	0.2495	0.3848	2
	Adaptable planning	0.3137	0.6483	1.0000	1
Knowledge Bank	Rudimentary Planning	0.0051	0.0106	0.0169	5
	Ineffectual Planning	0.0135	0.0281	0.0446	4
	Attainable Planning	0.0344	0.0716	0.1139	3
	Sustainable planning	0.1255	0.2612	0.4155	2
	Adaptable planning	0.3019	0.6285	1.0000	1
Stakeholders Designation	Rudimentary Planning	0.0069	0.0145	0.0255	5
	Ineffectual Planning	0.0145	0.0308	0.0541	4
	Attainable Planning	0.0385	0.0817	0.1433	3
	Sustainable planning	0.1429	0.3028	0.5312	2
	Adaptable planning	0.2690	0.5701	1.0000	1
Technology	Rudimentary Planning	0.0643	0.1302	0.2666	3

Network	Alternatives	Total	Normal	Ideal	Ranking
	Ineffectual Planning	0.0477	0.0965	0.1977	4
	Attainable Planning	0.0354	0.0716	0.1466	5
	Sustainable planning	0.1055	0.2134	0.4371	2
	Adaptable planning	0.2413	0.4883	1.0000	1
Form and Content	Rudimentary Planning	0.0066	0.0149	0.0298	5
	Ineffectual Planning	0.0222	0.0501	0.1002	4
	Attainable Planning	0.0370	0.0834	0.1666	3
	Sustainable planning	0.1557	0.3511	0.7014	2
	Adaptable planning	0.2221	0.5005	1.0000	1
Collaboration	Rudimentary Planning	0.0021	0.0049	0.0076	5
	Ineffectual Planning	0.0055	0.0126	0.0195	4
	Attainable Planning	0.0181	0.0415	0.0640	3
	Sustainable planning	0.1278	0.2931	0.4523	2
	Adaptable planning	0.2826	0.6479	1.0000	1
Time Dimension	Rudimentary Planning	0.0029	0.0059	0.0099	5
	Ineffectual Planning	0.0187	0.0384	0.0640	4
	Attainable Planning	0.0366	0.0751	0.1251	3
	Sustainable planning	0.1368	0.2806	0.4676	2
	Adaptable planning	0.2926	0.6000	1.0000	1
Viability	Rudimentary Planning	0.0010	0.0022	0.0031	5
	Ineffectual Planning	0.0042	0.0088	0.0128	4
	Attainable Planning	0.0292	0.0604	0.0876	3
	Sustainable planning	0.1158	0.2398	0.3482	2
	Adaptable planning	0.3327	0.6888	1.0000	1
Benefit	Rudimentary Planning	0.0291	0.0582	0.1259	5
	Ineffectual Planning	0.0378	0.0757	0.1637	4
	Attainable Planning	0.0674	0.1349	0.2918	3
	Sustainable planning	0.1345	0.2690	0.5821	2
	Adaptable planning	0.2311	0.4622	1.0000	1
Costs	Rudimentary Planning	0.0390	0.0780	0.1566	5
	Ineffectual Planning	0.0403	0.0806	0.1620	4
	Attainable Planning	0.0604	0.1209	0.2428	3
	Sustainable planning	0.1113	0.2226	0.4472	2
	Adaptable planning	0.2489	0.4979	1.0000	1
Opportunities	Rudimentary Planning	0.0179	0.0358	0.0666	5
	Ineffectual Planning	0.0219	0.0437	0.0812	4
	Attainable Planning	0.0567	0.1134	0.2107	3
	Sustainable planning	0.1344	0.2687	0.4992	2
	Adaptable planning	0.2692	0.5383	1.0000	1
Risks	Rudimentary Planning	0.0202	0.0404	0.0786	5
	Ineffectual Planning	0.0343	0.0685	0.1332	4
	Attainable Planning	0.0551	0.1102	0.2142	3
	Sustainable planning	0.1333	0.2666	0.5185	2
	Adaptable planning	0.2571	0.5143	1.0000	1

The weighted and Limit supermatrices for the clusters (components) and nodes (elements) for the control subcriteria are very difficult to read due to the large number of nodes. Each supermatrix needs to be split in several pages due to its size. This study could not justify the presentation of these matrices as they do not add value to understanding the higher level of priorities. It is more useful to synthesize the node influences on the subnet level and then show this high level presentation in tabular views as shown in Table 4.19.

4.9 SISP Maturity Model Synthesis

The conceptual theory offered enough material to specify a usable model for simulation. At the end of this research, all variables were chosen and a deep understanding of relationships between them was gained. The theoretical model developed offers an easy way of assigning different values for variable. This feature is utilised for deliberate manipulation of an independent variable to study the effects of this variable on another (dependent) variables. Having clear definitions and understanding of the variables involved, the end result were very pleasing; very few values were adjusted and the fits were as favourable as predicted.

Table 4.20 is a result of the report produced by the Super Decision program. This table shows the final result for all the 'Alternatives', being the five stages of SISP maturity.

To summarise, during this entire exercise a number of subsystems and their inputs and outputs were defined. The interactions between subsystems (clusters) were defined using relative measurements. The interactions were computed by comparing the elements one to another with respect to the control criteria. As a result, the overall ranking of the five SISP maturity stages were obtained. Table 4.20 shows that the results were obtained in accordance with theoretical expectations. The model synthesis provided the weights of the SISP maturity levels in logical order of importance (Figure 4.11). The Total and Ideal columns are the same in a hierarchical model such as this one (Saaty, 2003).

Table 4.20 Final Synthesis of Priorities for SISP Maturity Model

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	1 Rudimentary Planning	0.0359	0.0215	0.0359	5
	2 Ineffectual Planning	0.0549	0.0329	0.0549	4
	3 Attainable Planning	0.1160	0.0696	0.1160	3
	4 Sustainable Planning	0.4598	0.2759	0.4598	2
	5 Adaptable Planning	1.0000	0.6000	1.0000	1

Here is interpretation of these results. If an organisation scores a total weight of more than 0.46 that organisation is on its way to achieve the highest level of SISP maturity. Actually, to achieve the maturity level 5, an organisation needs as much as twice the score in comparison to the level 4. This finding is in accordance with the literature that reports that the highest level is very hard to achieve (Sutherland and Galliers, 1989, Ward and Griffiths, 1998, Earl 1993, Segars and Grover 1998). The scores of the actual surveyed organisations are reported and discussed in Chapter 6.

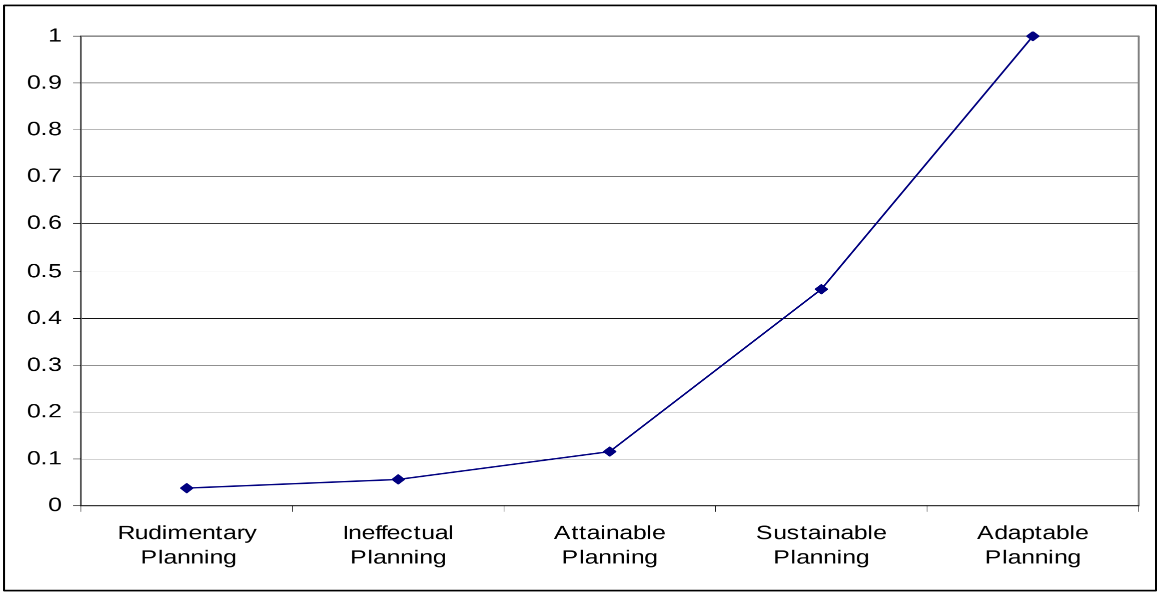


Figure 4.11 Graphical Presentation of Priorities for SISP Maturity Model

This example demonstrated the use of relative measurement for the ranking of alternatives. In contrast, if an established scale for rating alternatives is used one at a time, and not against each other, an absolute measurement would be performed. To assess the SISP maturity level of each organisation the 'standard' scales like Likert are used. Thus, an absolute measurement is needed. To recapitulate, the study needs: (1) the model based on the relative measurement for the ranking of SISP maturity stages, and (2) the model based on the absolute measurement (in combination with benchmarking) to assess the SISP levels for the surveyed organisations.

Note that the system allocates a rank of one to five where one is the highest rank that corresponds to a SISP maturity of level 5.

4.9.1 How the Alternatives Contributions Fed Forward

Figure 4.12 shows the significance of the criteria for the Adaptable level of strategic information systems planning.

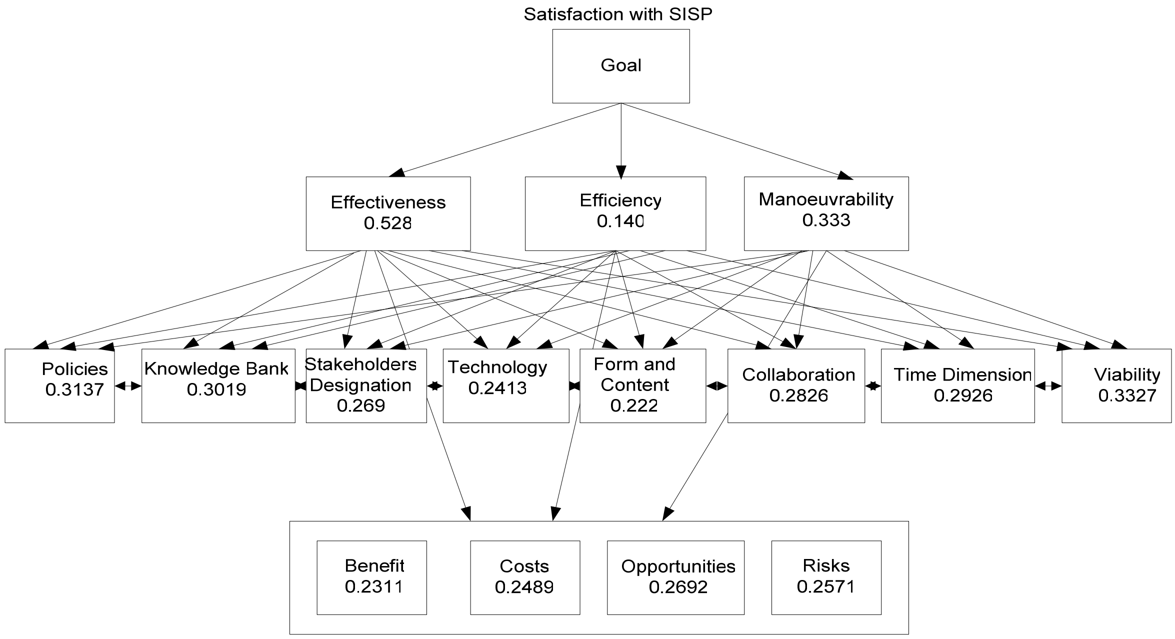


Figure 4.12 SISP Maturity Stage Five (Adaptable Planning) Hierarchy Showing Priorities

The major theoretical finding of this research are summarised in Table 4.21 and Table 4.22.

Table 4.21 SISP Maturity Model - Summary of Subcriteria Contributions

Rudimentary Planning	**Total Priority**	**Ineffectual Planning**	**Total Priority**	**Attainable Planning**	**Total Priority**	**Sustainable planning**	**Total Priority**	**Adaptable planning**	**Total Priority**
Technology	0.0643	Technology	0.0477	Stakeholders Designation	0.0385	Form and Content	0.1558	Viability	0.3327
Stakeholders Designation	0.0069	Form and Content	0.0222	Form and Content	0.037	Stakeholders Designation	0.1429	Policies	0.3137
Form and Content	0.0066	Time Dimension	0.0187	Policies	0.0366	Time Dimension	0.1368	Knowledge Bank	0.3019
Knowledge Bank	0.0051	Stakeholders Designation	0.0145	Time Dimension	0.0366	Collaboration	0.1278	Time Dimension	0.2926
Policies	0.0048	Knowledge Bank	0.0135	Technology	0.0354	Knowledge Bank	0.1255	Collaboration	0.2826
Time Dimension	0.003	Policies	0.0080	Knowledge Bank	0.0344	Policies	0.1207	Stakeholders Designation	0.269
Collaboration	0.0022	Collaboration	0.0058	Viability	0.0292	Viability	0.1158	Technology	0.2413
Viability	0.001	Viability	0.0042	Collaboration	0.0181	Technology	0.1055	Form and Content	0.222

SISP maturity is also assessed in terms of overall benefits, costs opportunities and risks (BCOR) as shown in Table 4.22.

Table 4.22 Benefit, Cost, Opportunity and Risk (BCOR) Synthesis for SISP Maturity Stages

Rudimentary Planning	**Total Priority**	**Ineffectual Planning**	**Total Priority**	**Attainable Planning**	**Total Priority**	**Sustainable planning**	**Total Priority**	**Adaptable Planning**	**Total Priority**
Costs	0.0390	Costs	0.0403	Benefit	0.0674	Benefit	0.1345	Opportunities	0.2692
Benefit	0.0291	Benefit	0.0378	Costs	0.0604	Opportunities	0.1344	Risks	0.2571
Risks	0.0202	Risks	0.0343	Opportunities	0.0567	Risks	0.1333	Costs	0.2489
Opportunities	0.0179	Opportunities	0.0219	Risks	0.0551	Costs	0.1113	Benefit	0.2311

4.9.1.1 Rudimentary Planning

The descending order of the weights in Table 4.21 shows that an organisation at this level is mainly concerned with technology acquiring. The decision of what to buy is made by the management who is concerned about costs as shown in Table 4.22. There is not much communication between technical and management actors. Plans are basic, and very often IT specification is a part of financial plans. As there is no formal planning process in place, Viability scores the lowest weight. This indicates that the internal and external environment have not been analysed and that Risk and Opportunities are not influential factors. Policies are not in place or not used. The Knowledge to put together the IT needs is very often hired. If the Rudimentary organisation wants to move towards the next stage, it should put more priorities on formal planning by establishing regular planning time frames and put more efforts in the Form and Content of the plan. The contribution of every subcriterion is detailed in Table 4.21.

4.9.1.2 Ineffectual Planning

The need for the use of formal methodologies and structured techniques is acknowledged, but planning is done more as a proforma, and SISP is not rigorously planned or tracked. This is confirmed by scoring higher weight on the Form and Content subcriteria in regard to Rudimentary Planning. The organisation at this level still has full emphasis on IT technology as its information services are probably not properly organised. Business management is not aware of the strategic value of IT. They still see IT investments as pure costs. These investments are recognised as necessary to improve efficiency and communication, but they are not associated with enhancing business values. IT management does not participate in business planning and IT values are not communicated across the organisation. Policies are not adequate as they do not incorporate IT needs or they are often abandoned under the pressure of deadlines. Plans are not strategic and out of date. Planning is a one-shot activity, which sets goals and objectives which are not followed and not in alignment with business needs. Viability scores the lowest rank as information input to the planning process is not a result of a comprehensive environmental analysis. The contribution of every subcriterion for this level of planning is showed in Table 4.21.

4.9.1.3 Attainable Planning - Causing Federalisation

As Table 4.22 shows, Stakeholders Designation subcriteria has number one ranking. At this level of planning, successful SISP depends heavily on the commitment from the top management level. Management is involved in SISP formulation, evaluation, and control. Organisations have established sound IT infrastructure, and the IT department is technically strong. This is reflected by the position of the Technology criterion which shows that technology is not of main importance in organisations at this stage of SISP maturity.

SISP goals are aligned with departmental business goals but still the ‘Collaboration’ criterion scored the lowest value. This is explained by the fact that vertical collaboration within the organisation is not established. End users deploy many different computing systems and prepare their own IT operational plans in isolation from other IT plans. These plans are inconsistent in form and content with the other plans. There is a central IS/IT department who dictates an overall IS strategy. As was said, other departments have their miniature IS/IT functions retaining their own controls on I/IT plans. This is a main characteristic of this Stage of maturity and it is called a federation type of planning. SISP plans are simultaneously strategic and operational and very often far from real business needs as indicated by the low score on Viability.

At this level, SISP is starting to be judged by the benefits it brings to the organisation. Still opportunities that may be missed are not investigated which is reflected by the weights in the BCOR cluster.

4.9.1.4 Sustainable Planning (Achieving Adhesion)

The technological and organisational advancement in organisations is reflected by mature SISP planning. An organisation at this level puts full emphasis on the effectiveness of SISP. Form and Content scores the highest rank as the plans are structured, based on the appropriate methodology and reflects results of thorough analysis of the internal and external environments. The planning inconsistencies, very often evident in the preceding maturity stage, now are overcome through synchronisation by the central IT planning function if established or coordinated across different business units. SISP acts as an agent for adhesion of internal functions.

SISP review meetings promote organisational learning and performance feedback mechanisms are in place, but they are rather event driven and episodic than continuous, this is reflected through the weights of Knowledge Base and Viability. The importance of the IT function is widely recognised. Integrated relations are established throughout the organisation as all areas gain understanding of other areas and work together towards common goals. Still, very strong support from management structure is an imperative for successful SISP. Strategic planners start to explore the IT opportunities for competitive advantage. The importance of benefits and opportunities outweigh the importance of the costs (Table 4.21).

4.9.1.5 Adaptable Planning–achieving Cohesion

Organizations belonging to level 5 have established sound IT infrastructure, and have gained experience in producing efficient and effective plans. The focus of their SISP efforts are neither Form & Contents nor Technology (they are list scored) but the ways of optimizing SISP and keeping it strategic (Table 4.21). It is not surprising that Viability scores the highest rank as it represents the ability to adapt to environmental changes through scenario planning and continuous feedback for optimisation and control.

High quality partnership relations with the business function guarantee synchronisation with business needs. Alignment is not only related to the business. The influence of relevant social, political, technological, and economic factors on the IT function is incorporated in SISP and that is why Opportunities and Risk achieved the highest score. The importance of Opportunities and Risk outweigh the importance of the Costs and Benefit. Established policies are the reflection of the knowledge and experience. That is the reason why Policies scored a very high rank.

The score of the 'Stakeholders Designation' subcriteria was not what the study expected. These subcriteria represent powerful organisational actors involved and committed to SISP. The surprisingly low value of this score is explained by the fact that knowledge, experience and information sharing made all involved in the SISP process aware of their responsibility to support and make SISP a smooth continuous process. Also, a danger of 'over-planning' is avoided if management is not 'over' committed to SISP.

4.10 Usage of the SISP Maturity Model

The developed SISP maturity model can be used for:

- Hypothesis testing

- Assessment of the stage of SISP maturity of any organisation
- Study of relations between SISP constructs
- Basis for fine tuning the model for specific type of organisations

The hypothesis testing conducted in Chapter 6 is partly done using the Sensitivity analysis tool provided by the 'Superdecision Software' which enables the observation of outcomes where one or more independent variables change its priorities. Sensitivity analysis is discussed in more details in following sections.

The relationship between SISP constructs can be easily explored using what-if bases by introducing changes in priorities within the model or by utilising the Sensitivity Analysis tool.

4.10.1 The SISP Assessment Model

To be able to use the developed SISP maturity model, steps for application of the absolute Rating combined with Benchmarking, as described in Chapter 3, are taken for the establishment of *the SISP assessment model*. In this model the 'Alternatives' are organisations. Because the organisations are not exhaustive and there may be others that are better or worse, the establishment of the best possible alternative, known as the ideal is required. This ideal alternative (best on every criterion) is used as a Benchmark to compare each of other alternatives (organisations) with it. The main benefit of benchmarking is that a rank order of these alternatives will not be affected even if some of the existing alternatives are deleted or new ones introduced. When all data from the survey were entered and the model synthesised, results as shown in Table 0.1, Appendix D were obtained. These results are analysed in Chapter 6.

4.11 The SISP Maturity Model Sensitivity Analysis

The study uses the feature supplied with the Super Decisions to test the responsiveness or sensitivity of the SISP maturity stages to major criteria and subcriteria priority changes. Sensitivity is tested by changing the priority of one criterion and keeping the proportions of the priorities for the other criteria the same so that again they all, including the changed criterion, add to one. This is a what-if type of sensitivity that allows the selection of any combination of independent variables (Saaty, 2001b).

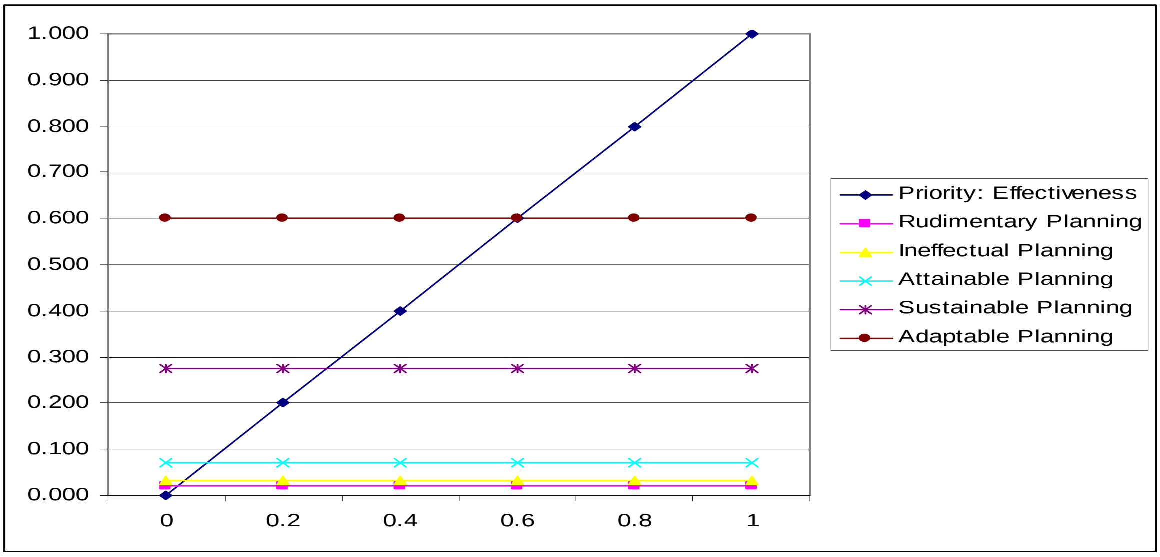


Figure 4.13 The SISP Maturity Model Sensitivity Graph for Effectiveness

Sensitivity analysis showed that the model developed is robust. The outcome is very stable and does not change the overall ranks for any of the main criteria. Figure 4.13 shows the sensitivity graph for the Effectiveness criteria. This graph is representative for Efficiency and Manoeuvrability as well. Similar sensitivity tests were performed for all subcriteria. It is found that the outcome is also very stable for all sub subcriteria except for changes of the Technology subcriteria. This is shown in Figure 4.14.

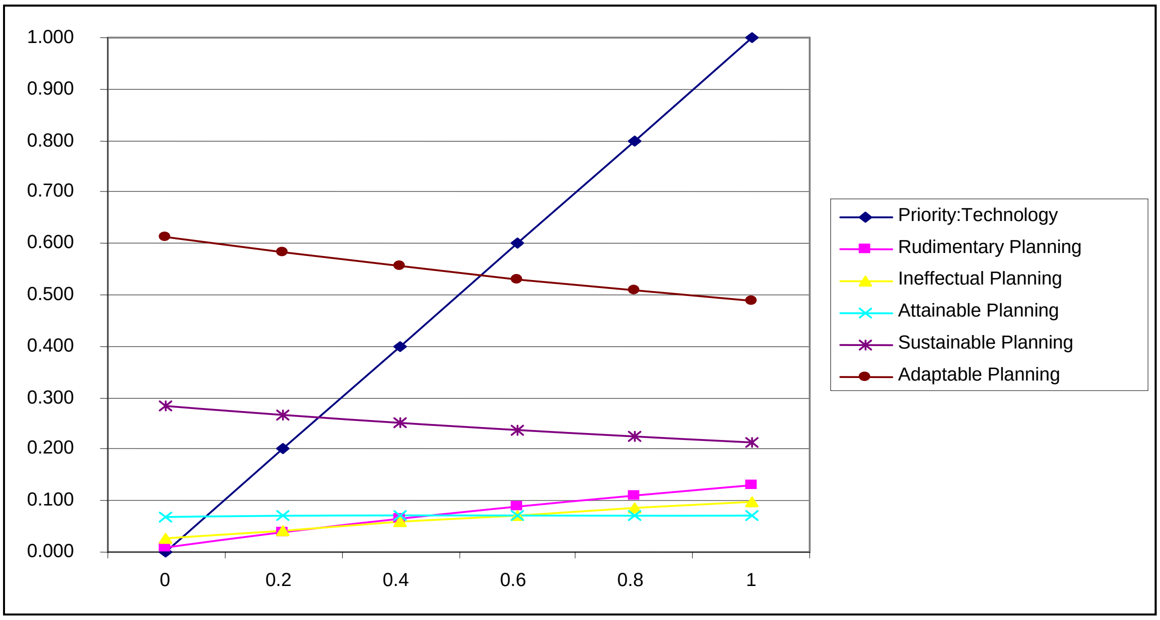


Figure 4.14 The SISP Maturity Model Sensitivity Graph for Technology

When the priority of the Technology subcriteria increases from 0.2413 to 0.279, then the rank of the Rudimentary and Ineffectual planning is swapped. It requires a significant change in the Technology subcriteria (increase to 0.0584 and more) in order to reverse the ranking of the Rudimentary, Ineffectual and Attainable SISP maturity stages.

The test conducted to see the dependency of all the main criteria and the Technology subcriteria confirmed that this subcriterion will cause a rank order change only for the three lowest ranked SISP maturity levels. In addition, the study performed the sensitivity analysis on Benefits, Opportunities, Costs and Risks. No matter what the values of Benefits and Opportunities were, the rank order of SISP maturity stages did not change.

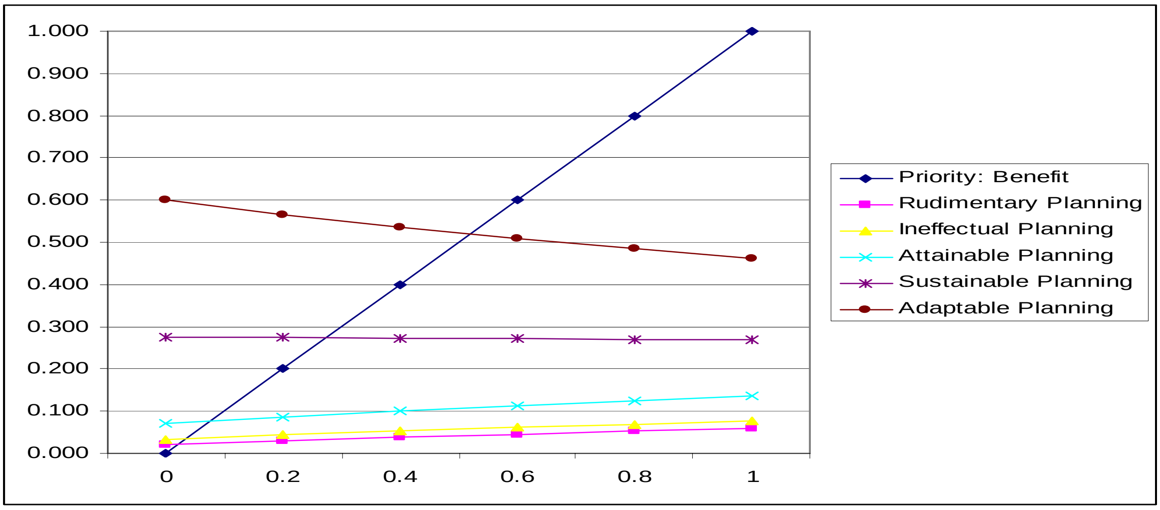


Figure 4.15 The SISP Maturity Model Sensitivity Graph for Benefit

Figure 4.15 shows the sensitivity analysis for Benefits. A similar graph was obtained for Opportunities (not shown in this document). A change in the priority of the Costs and Risks influences the rank order of the SISP maturity stages. The sensitivity graph for Costs is shown in Figure 4.16.

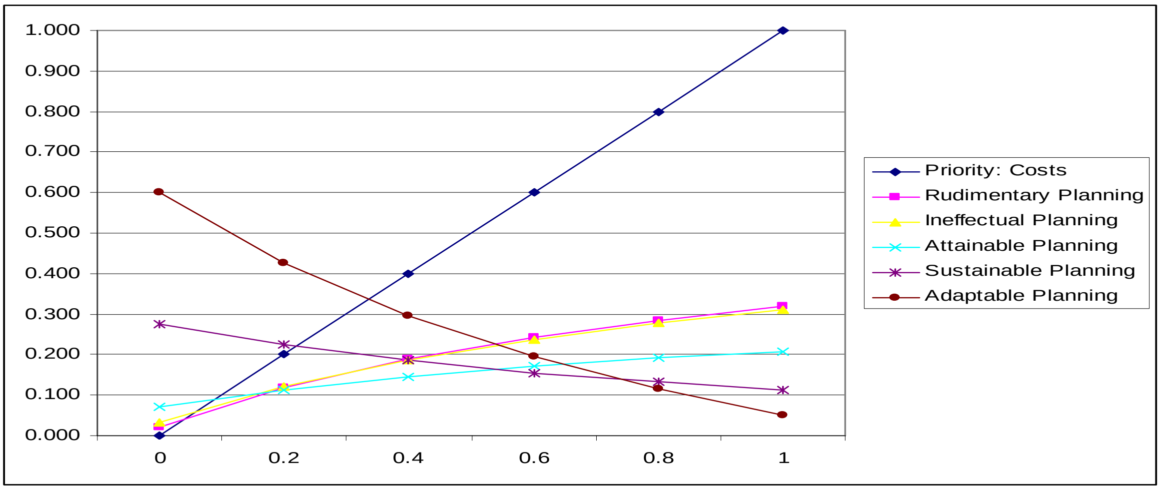


Figure 4.16 The SISP Maturity Model Sensitivity Graph for Costs

As shown in Figure 4.17, if the Costs priority is higher than Benefits, a reversal of rank order of the SISP maturity stages occurs. This is as per expectation, additionally proving the correctness of the model.

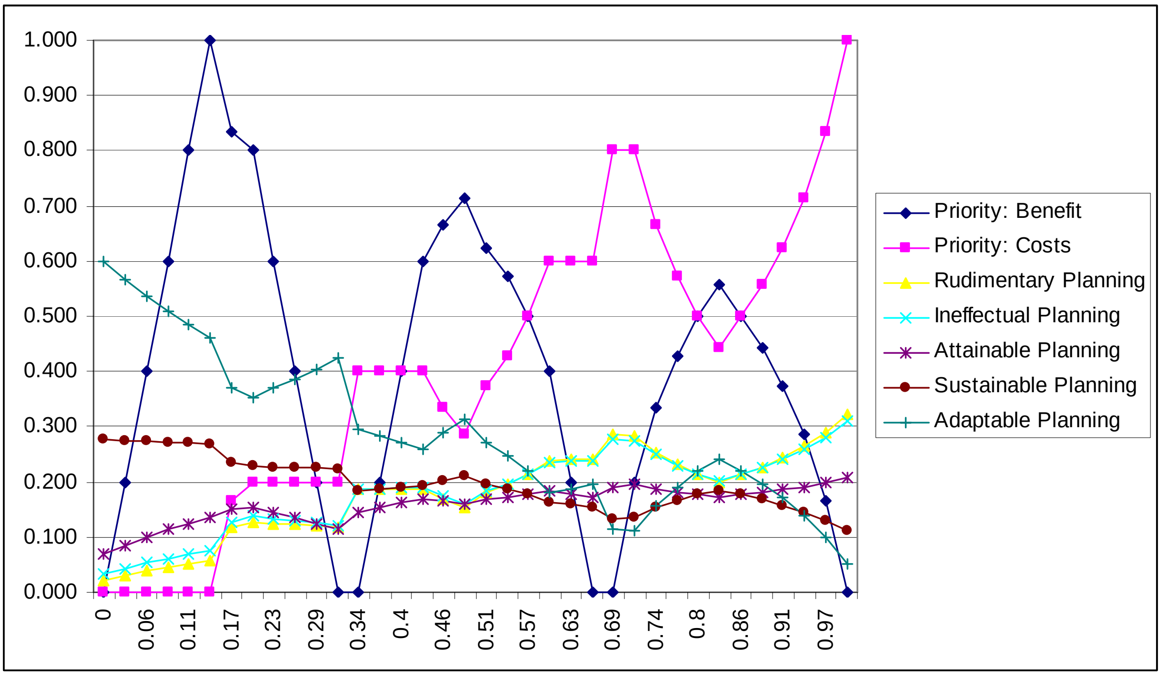


Figure 4.17 The SISP Maturity Model Sensitivity Graph for Benefits and Costs

4.12 Validation of the SISP Assessment Model

As discussed in Chapter 3, the SISP models should be validated against real data, sampled from the real process to be modelled (Korb and Nicholson, 2004). During the Pilot Survey, the SISP assessment model was tested with two imaginary TEST1 and TEST2 companies. TEST1 was the benchmark company (the organisation that scored the highest rating for every criterion). TEST2 was a company targeted to be at Level three of SISP maturity. Judgement of TEST2 was done according to the criteria defined for that level. The result received was the degree of how far TEST2 was from achieving the benchmark. The received weight was in accordance to expectation. Actually, any deviation from the expected result would be an indication that the mathematics and formulas applied behind the scene were inaccurate or were based on inconsistent judgement. This was proof of the integrity of the model. The results received are shown in Appendix D. Then, the survey data from the five pilot companies were entered in the model. Those results are not shown separately, they are part of the overall scores for all surveyed organisations, shown in Table 0.1, Appendix D and discussed in Chapter 6.

4.13 Conclusion

This Chapter demonstrated how the two major tasks involved in this study were accomplished. The first task was to establish the SISP maturity model and the second task was to provide a means for its evaluation. Therefore, this Chapter defined the SISP maturity and proposed the five-stage SISP maturity model. The reasons for this proposition were discussed and each SISP maturity stage was delineated. The narrative descriptions of each level of SISP maturity was not precise enough to capture all kinds of interactions and to express different levels of planning in such (weighted) a form that can be of practical use. Thus, the need for a precise criteria definition for SISP maturity levels evaluation was recognised.

For that reason, a detailed definition of the criteria and subcriteria used for the assessment of SISP maturity levels were provided. First, the criteria and subcriteria were prioritised among themselves. Judgements of the importance of the criteria/subcriteria were based on the literature references shown in Table 4.14 to Table 4.16. The outcomes for the priorities of the criteria/subcriteria are shown in Table 4.10 and Table 4.11 respectively. Then, the priorities given to the subcriteria with respect to the main criteria were presented. Finally the contributions of the nodes (elements) organised in clusters within the subcriteria subnets were judged. Each subnet has one cluster named ‘Alternatives’ whose nodes are the maturity stages of SISP. The results for the alternatives were obtained when the synthesis of the priorities for the entire model was conducted.

The major findings of this Chapter are summarised in Table 4.20. The final results for each SISP maturity level were discussed with respect to the subcriteria. The developed model showed that the biggest efforts were needed to advance form Attainable Planning to Sustainable planning. An organisation needs twice as much effort to progress from the Sustainable planning to Adaptable Planning level. Viability and Policies are the highest ranked subcriteria for Adaptable Planning. Stakeholders’ Designation scores lower than expected on this level of planning. This is explained by organisational maturity being on high level, thus all responsibilities are well established and organisational culture, experience and information sharing are not an issue. Adaptable Planning has an accent on having strategic policies in place that govern the production of a viable SISP.

This Chapter has demonstrated that by using AHP/ANP it is possible to assess the complex phenomenon as SISP in a systematic way and derive a ratio scale for SISP maturity levels. This is a unique attempt in this field to utilise mathematical theory to elicit judgements and derive ratio scales.

The synthesis of all factors and their relations expressed through priorities constitute a base for the development of the SISP maturity assessment model. This model utilises absolute measurement and benchmarking to act as a tool for easy assessment of SISP maturity level in any organisation.

The study will now employ structural equation modelling on the data obtained from a mail questionnaire survey of 260 Australian organisations to statistically confirm that the SISP maturity model fits the data.

CHAPTER 5

5 SEM: SISP MEASUREMENT and STRUCTURAL MODEL

5.1 Introduction

Previous chapters have introduced the five-stage SISP maturity theoretical model, the definition of a research instrument and demonstrated the use of the ANP/AHP theory for the SISP maturity assessment. Thus, they addressed the main research question of how the maturity of SISP can be modelled. This chapter has the main accent on the complementary approach to ANP/AHP, the Structural Equation Modelling (SEM), based on the maximum likelihood estimation as the model-testing procedure, to statistically confirm that the model fits the empirical data collected in an Australia-wide survey. The core of the SISP model is tested by SEM as assumptions regarding the sample size according to complexity of the model cannot be met. SEM is conducted in two steps explained in Chapter 3. The first step is the establishment of the measurement model and then the structural model (model as a whole) is developed. The assessment of both models is discussed in detail.

5.1.1 Reliability of Subscales Used in SEM

One of limitations imposed by sample size on Structural Equation Modelling is the number of the measured variables that can be used for modelling. Actually, the number of parameters dictates the minimal sample size required. This is a more restrictive requirement as each measured variable is associated to 3 parameters. According to statistical sources (Norman and Streiner, 2003; Bryant and Yarnold, 1995) at least 5-10 cases should be allowed per parameter. The study allows 7 cases per parameter. The usable sample size is 260 cases, thus we can allow the model to have only 12 variables. Each latent factor must have two observed variables at a minimum, thus the SISP maturity model was respecified to accommodate for these limitations. In short, to comply with sample size limitations, the maximum number of latent factors used was six, each was represented by two observed variables.

The study revisited the theoretical model to assess which two latent factors can be dropped without significantly affecting the overall model accuracy. A decision was made that the Policies and Knowledge factors, because of their strong correlation with each of the main criteria could be removed without considerably impacting the overall model accuracy. In the process of selecting 12 observed variables, it was possible to use data parcelling or factor scores (perform data reduction), but as suggested by Rowe (2002) and many other researchers he cited, this approach has at least two major problems. One problem is that the unit weight addition of the observed variables ignores the possibility that the variables contribute differently. Secondly, the unit weight addition may invalidate the composite score if one or more observed variables measure a construct other than the one under consideration. It was suggested that the use of raw, unweighted data will avoid miss-specified and misleading estimates (Rowe, 2002). As a model with fewer observed variables per latent factor will have a higher apparent fit than a model with more observed variables per factor, the study will report the fit coefficients which reward parsimony, as a way to adjust for this tendency. On the other hand, to guard against Type I error inflation (Cohen et al., 2003) it is suggested to avoid the use of more variables or more sets of variables than are needed to frame the issue – 'less is more'.

The criteria for the selection of the measured (observed) variables were defined based on the following questions: (1) how reliable the observed variables are? and (2) are the chosen variables the best ones to represent the construct? This was extremely difficult and complex task. Multiple indicators of each construct were formulated through the cautious combination of particular items. For example, to find two observed variables to best represent the Form & Content latent factor which in its definition imply different aspects (such as quality and formality), items were selected according to the content to equalize the measurement weighting across indicators and to pass the test of item reliability. Reliability decreases when the number of scale items decreases and vice versa. Having only two items per scale, the Cronbach's alpha may show lower reliability where it may not be the case. A value for alpha of 0.6 was considered very a good indicator of the reliability in this case, and specifically when observed variables originated from different subscales, each on its own proved to reliably measure the construct. Table 5.1 lists the chosen pairs of measured variables to represent different latent factors, their description and their reliability (internal consistency) coefficients.

Table 5.1 Reliability of Subscales Used in SEM

Items	Description	Alpha/ Standard Alpha
q20.5 q23.1	SISP team has strategically thinking capability SISP team selects and follows adequate planning approach	0.6082/0.6088
q36.3 q36.4	IS Plan supports business strategies IS Plan selects a portfolio that maximizes total business value	0.6874/0.6875

Items	Description	Alpha/ Standard Alpha
q24.4 q26.2	Senior business management supports SISP processes CIO is committed toward SISP from start to finish	0.7842/0.7857
q30.4 q45.7	Learning of technology applications are shared Automation tools for metrics collection and analysis are used	0.6450/0.6451
q18.5 q44.5	SISP planning is continuous activity Measurement of SISP objectives is continuous process	0.6029/0.6030
q28.1 q28.4	During SISP formulation a predictive study is undertaken Qualitative and quantitative scenario analysis is undertaken to understand the consequences of a wide range of possible changes	0.6860/0.6864

As can be seen from Table 5.1, every observed pair representing a unique construct is reliable (alpha>0.6). The overall reliability of the 12 items scale (Table 5.2) is equal to .74 and considered satisfactory, although not particularly strong, suggesting that there are still unexplained variances. However, the overall reliability is somewhat deflated due to the small number of items.

Table 5.2 The overall reliability of SISP constructs

Reliability Analysis Scale (Alpha) Item-total Statistics					
Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
Q20.5	23.8231	19.1655	0.3218	0.2736	0.7195
Q23.1	23.8423	19.2685	0.3093	0.2508	0.7208
Q36.3	20.6423	17.2113	0.3350	0.3223	0.7147
Q36.4	20.7577	16.8716	0.3822	0.3224	0.7077
Q28.1	20.8154	16.4677	0.4431	0.3514	0.6983
Q28.4	20.8385	16.5375	0.4043	0.3447	0.7045
Q24.4	20.8231	15.2195	0.4624	0.4596	0.6968
Q26.2	20.7	14.3112	0.5204	0.4885	0.6866
Q30.4	22.5577	18.5333	0.3636	0.2885	0.7132
Q45.7	22.4769	18.5748	0.3479	0.3225	0.7144
Q18.5	23.2654	18.9525	0.2975	0.2323	0.7193
Q44.5	23.2462	18.9276	0.3129	0.2383	0.7183
Tukey estimate of power to which observations must be raised to achieve additivity = 0.1897					
N of Cases = 260.0 N of Items = 12					
Alpha = 0.7280 Standardized item alpha = 0 .7437					

To test the assumption that there is no multiplicative interaction among items in the scale, we also checked the results of Tukey's additivity test. The excellent (low) value of this test (0.1897) confirmed that the reliability of the scale is appropriate, such that there is no need for transforming of the data. According to Norusis (1988) it can be assumed that the scale developed is linear.

Estimating (and if necessary respecifying) the measurement model for each latent factor separately is proposed (Joreskog, 1993). This is suggested to demonstrate the reliability of the measured variables. Providing only two observed measures per latent variable is not achievable as each sub-model will have zero degrees of freedom. In that case, the sub-models should fit the data perfectly, and the chi-square statistic should be zero. Consequently, no probability level can be assigned to the chi-square statistic and virtually the sub-models are untestable.

Instead, multiple correlation (R2) for each observed item is reported which is the measure of item reliability with respect to its underlying latent construct.

5.1.2 SEM: Testing for the Factorial Validity of Scores from a Measuring Instrument (First-Order CFA model)

The CFA procedures are used for testing the validity and reliability of subscales variables, factor loading and fit of the model. This process is known as the measurement model test and is the most important and most difficult step in the SEM procedure. It must prove that the model is valid before making any attempt to evaluate the structural model. A diagrammatic representation of the hypothesized (CFA) model under study is shown in Figure 5.1.

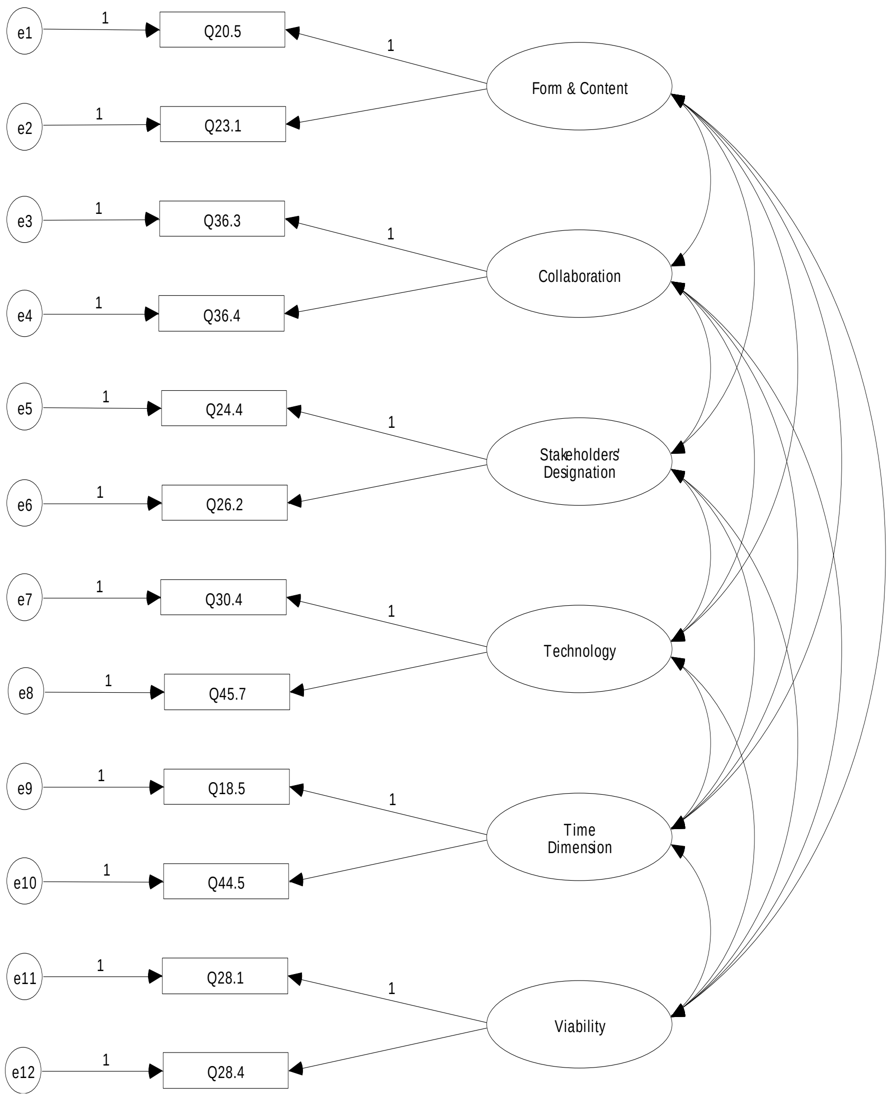


Figure 5.1 SISP Measurement Model

5.1.2.1 Hypothesis 1: SISP is a First-Order Single-Factor Model

If a single-factor model cannot be rejected, then there is little point in evaluating more complex one (Kline, 1998). Regardless of how good multi-factor theory is grounded, the research should determine whether the fit of a simpler (one-factor model) is comparable. Table 5.3 shows the goodness of fit statistic. Figure 5.2 is the graphical presentation of the single-factor model.

Table 5.3 A First-Order Single-Factor SISP Measurement Model Fit Summary (Selected Outputs)

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	PCFI
SISP - One Factor Model	351.539	54	0.000	6.510	0.068	0.814	0.732	0.493	0.146	0.430

Model	HOELTER 0.05	HOELTER 0.01
SISP - One Factor Model	54	60

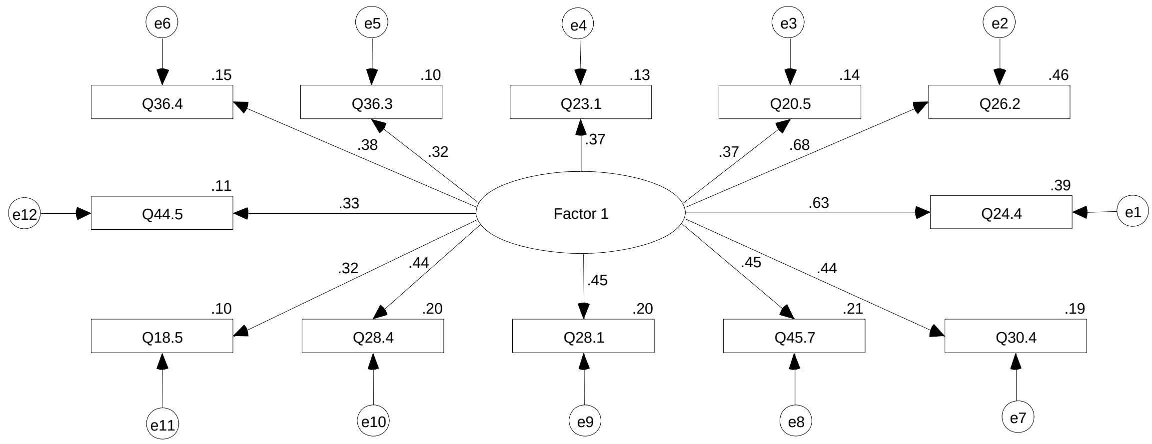


Figure 5.2 A Single-Factor SISP Measurement Model Showing Standardized Estimates

Parameter estimates, fit indices and observed residuals demonstrate that a first-order single-factor model poorly fits these data. The overall chi-square is $\chi2(54) = 351.539$ and significant at the 0.001 level indicating that the fit of the data to the single-factor model is not entirely adequate. Researchers resist to reject model solely on $\chi2$ distribution ($p>0.05$) criteria because this statistic is sensitive to sample size. In this case a lager value is expected given the reasonably large sample size of 260. However, all other indices represent a poor fit to the data. None of them exceeds the recommended cut off values; the ratio of the chi-square to the degrees of freedom is $\chi2/df=6.510$; the Goodness of Fit Index GFI=0.814 and all other indexes are less than the recommended values. The goodness of fit measures for this measurement model imply that the observed variables measure more than one domain. This enables the rejection a 'single-factor model' but before proceeding with the evaluation of the multifactor models, one more test was performed.

If the correlation between factors is constrained to be equal (in another words, the correlation is perfect and all factors are the same), the multi-factor model essentially becomes a single-factor model. Thus, the single-factor model is nested (hierarchical) within the six-factor model. In this case, $\Delta\chi2$ statistics is used as a significance test (only applicable for hierarchical models). The utilised Statistical Package for the Social Sciences (SPSS- AMOS) has the capability to compare two models, unconstrained and constrained measurement models and to provide the nested model comparisons output (shown in Table 5.4).

Based on $\Delta\chi2$ (14) statistics, which is 53.720 and significant at the 0.001 level it can be said that the fit of single-factor model was significantly worse than that of the six-factor model.

Table 5.4 Nested Model Comparisons

Assuming model 'SISP Measurement Six-Factor Unconstrained Model' to be correct:							
Model	**DF**	χ^2	**P**	**NFI Delta-1**	**IFI Delta-2**	**RFI rho-1**	**TLI rho2**
SISP Equal Covariance Constrained	14	53.720	0.000	0.077	0.082	0.056	0.062

Also, all other goodness-of fit statistics (Table 5.5) showed that the unrestricted covariance model (six-factor model) was superior to the equal covariance constrained model (a single-factor model).

Table 5.5 Unconstrained and Constrained a First-Order Six-Factor SISP Measurement Model

Model	χ^2	**DF**	**P**	χ^2**/DF**	**RMR**	**GFI**	**AGFI**	**NFI**	**RMSEA**	**PCFI**
SISP Measurement Model Unconstrained	62.023	39	0.011	1.590	0.023	0.962	0.924	0.911	0.048	0.569
SISP Equal Covariance Constrained Measurement Model	115.743	53	0.000	2.184	0.057	0.935	0.905	0.833	0.068	0.723

Model	**HOELTER 0.05**	**HOELTER 0.01**
SISP Measurement Model Unconstrained	228	261
SISP Equal Covariance Constrained Measurement Model	159	179

Based on Table 5.5 statistics the single-factor model is rejected.

5.1.2.2 Hypothesis 2: SISP is a First-Order Three-Factor Model

The rationale for the three-factor model testing lies in ``the need for a simpler multifactor model as a baseline for the fit of the hypothesized model under study. The inability to reject a simpler multifactor model (Kline, 1998) indicated that a more complex model will not fit the data and the testing can stop at that point. The statistics for the baseline model are shown in Table 5.6 and the model itself in Figure 5.3.

Table 5.6 A First-Order Three-Factor SISP Measurement Model Fit Summary

Model	χ^2	**DF**	**P**	χ^2**/DF**	**RMR**	**GFI**	**AGFI**	**NFI**	**RMSEA**	**PCFI**
SISP – First-Order Three-Factor Model	244.828	51	0.000	4.801	0.043	0.863	0.791	0.647	0.121	0.534

Model	HOELTER 0.05	HOELTER 0.01
SISP – First-Order Three Factor Model	73	82
Independence model	33	36

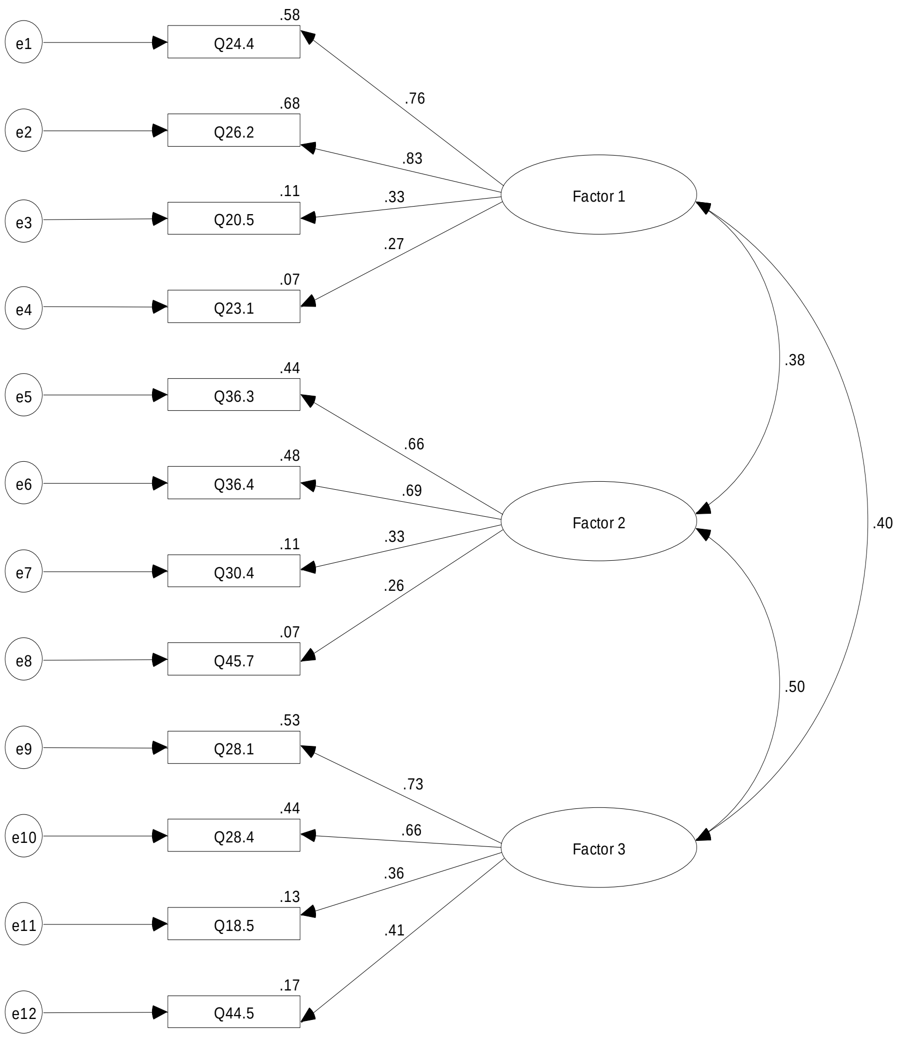


Figure 5.3 A First-Order Three-Factor SISP Measurement Model (Standardized Estimates)

From Table 5.6 it is evident that this measurement model is a better fit for the data model than the one-factor model. However, this model still poorly fits the data. The overall $\chi2(51)$ =244.828 statistic is significant at the 0.001 level, which was expected given the reasonably large sample size (260). The loss of three degrees of freedom can be explained by the estimation of two additional factor variances and three factor covariances, with the estimation of two fewer factor loadings. All other indexes of fit reflected the fact that this SISP measurement model was not well represented by the hypothesized three-factor model. In particular, the $\chi2$/df =4.801, GFI=0.863, and RMSEA=0.121 were strong indication of poor fit and Hypothesis 2 is rejected.

5.1.2.3 Hypothesis 3: SISP is a First-Order Six-Factor Model

A diagrammatic representation of the hypothesized first-order measurement model under study is shown in Figure 5.4. The SISP structure modelled by AHP allows for multidimensionality to better simulate real processes, in other words, one observed variable can load more than one factor as it can really measure more than one domain. Figure 5.4 shows selected restricted subset of measured variables to hypothesise that they represent the unidimensional measurement model. Thus, subscales of the measuring instrument represent the factors and items of those subscales should load only on its related factor.

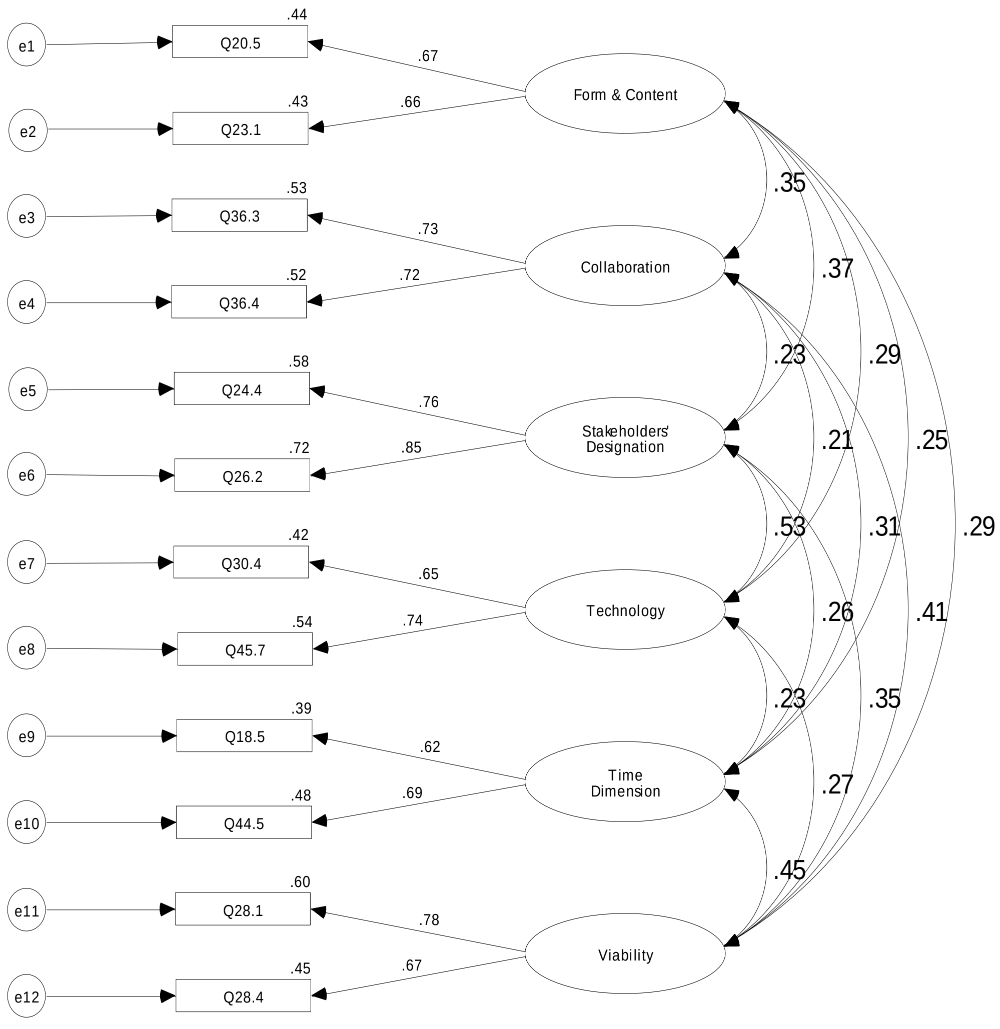


Figure 5.4 A First-Order Six-Factor SISP Measurement Model (Standardized Estimates)

In structural equation modelling principal axis factoring (PAF) (also called principal factor analysis) is preferred for the purposes of confirmatory factor analysis (Widaman, 1993). From the measuring instrument, selected are 12 indicators that best represent the six hypothesised factors: Form & Contents, Collaboration, Stakeholder's Designation, Technology, Time Dimension and Viability. Using PAF, extraction of 6 factors were requested (Figure 5.5) and the direct oblimin rotation was used. The oblimin rotation is the standard rotation method which allows the factors to be correlated. As expected, the solution converged to six factors, extracting 53.77 % of variance, with eigenvalues above one.

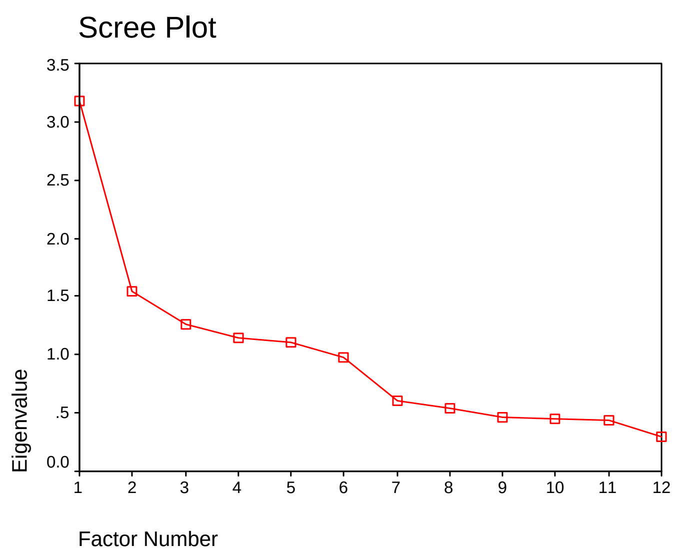


Figure 5.5 SISP CFA: A Scree Plot of the Eigenvalues

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the six factor solution was 0.675, which suggested a mediocre degree of homogeneity of variables. This result suggests that the scale is appropriate for factor analysis. Further, the Bartlett's Test of sphericity statistic is large (680.684) and significant ($p<.005$), thereby indicating linearity of correlations between the sets of data. This result also indicates the appropriateness of factor analysis for this scale.

The SISP measurement model depicted in Figure 5.4 represents the restricted (hierarchical) version of the model shown in Figure 4.2.

The hypothesized six-factor model of SISP structure was over-identified with 39 degrees of freedom. Of the 57 parameters in the model, 39 were freely estimated and 18 parameters were fixed (constrained to 1). There are 78 sample moments derived from the twelve observed (endogenous) variables in the model (used formula is: $p(p+1)/2$, where p is 12 observed variables). The latent (unobserved) variables have no definite metric scale, therefore the scale for the latent variables was established by constraining the first parameter in each set of observed variables to a value of 1. Measurement errors (e1 to e12) were unobserved, independent variables in the model. They reflect two kinds of unique variance: random error and systematic error (Kline, 1998).

The model was analysed (as all others) by AMOS(5). A threshold for the modification indexes (MI) of 4 to be included in the output file was defined. The minimum discrepancy (CMIN in AMOS terms) commonly expressed as a chi-square $\chi 2$ was 62.023 with 39 degrees of freedom.

Table 5.7 A First-Order Six-Factor SISP Measurement Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	PCFI
SISP - Six Factor Model	62.023	39	0.011	1.590	0.023	0.962	0.924	0.911	0.048	0.569

Model	HOELTER 0.05	HOELTER 0.01
SISP - Six Factor Model	228	261
Independence model	33	36

The null hypothesis H0 assumes that model specification is valid and $\chi 2$ test the difference between H0 and the hypothesized model (H3). The smaller value of $\chi 2$ indicated that observed data closely fitted the model and ideally there should be no difference between the two. The probability associated with $\chi 2$ was p=0.011 and $\chi 2$/df =1.590 (less then 2). Since the probability value of the chi-square is smaller than the 0.05 level. This implied that the model did not fit the data adequately. But, because the chi-square test is sensitive to sample size and non-normality, it is widely accepted that the other indexes are better indicators of the model fit. The goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI) and parsimony adjusted comparative fit index (PCFI) are 0.962, 0.924, 0.911 and 0.569 respectively. All indexes are greater than their respective cut-off values and having an excellent normed $\chi 2$ can be concluded that the observed data fitted this initial model well.

The appropriateness of the standard errors and the statistical significance of the parameter estimates were then checked. Standard errors should not be excessively large or small and no definitive criterion of ‘small’ and ‘large’ has been established (Byrne, 2001). Thus, it can be assumed that the range for standard errors from 0.07 to 0.26 associated with regression weights (slope of regression line), covariances and variances is acceptable. All factor loadings were significant ranging from 0.62 to 0.85. Also, a close look at the parameter estimates showed that factor loadings and all other parameter estimates were statistically significant (CR>±1.96). Therefore there were no factors that needed to be dropped from the model. The squared multiple correlations (a useful statistic that is not dependant on units of measurement) ranging from 0.39 to 0.72

were statistically significant (>0.3) in representing the proportion of variance explained by the observed measures.

5.1.2.3.1 Model Misspecification

Although the first-order six-factor measurement model is a good fit for the data, it is customary to check the residuals and modification indexes to see if it is possible to improve the model and if there is substantive support from theory to justify the improvement.

A close examination of the residuals (Table 5.8) revealed that there were no large covariance discrepancy between variables, all values were not statistically significant and well below the cut-point of 2.58 (Birne, 2001).

Table 5.8 Standardized Residual Covariances - First-Order Six-Factor Measurement Model

	Q45.7	Q20.5	Q23.1	Q28.4	Q28.1	Q26.2	Q24.4	Q30.4	Q18.5	Q44.5	Q36.3	Q36.4
Q45.7	0.000											
Q20.5	-1.448	0.000										
Q23.1	0.939	0.000	0.000									
Q28.4	-0.876	1.139	-0.092	0.000								
Q28.1	-0.723	-0.387	-0.282	0.000	0.000							
Q26.2	-0.027	0.131	-0.320	1.590	-0.394	0.000						
Q24.4	0.595	0.920	-0.642	-0.271	-0.842	0.000	0.000					
Q30.4	0.000	0.305	0.498	0.504	1.537	-0.169	-0.520	0.000				
Q18.5	0.852	-1.400	0.839	-0.662	0.032	-0.130	0.500	-0.286	0.000			
Q44.5	0.013	-0.354	0.830	0.616	-0.097	-0.264	0.228	-0.743	0.000	0.000		
Q36.3	-1.116	0.095	-0.401	-0.483	0.703	-0.939	-0.682	1.021	0.303	-0.010	0.000	
Q36.4	0.058	0.052	0.260	-1.149	0.304	1.101	0.495	0.541	0.540	-0.637	0.000	0.000

Evidence of model misspecification is captured by the modification indexes (MI). Reviewing the parameters related to the covariance and regression weights it was found that there were no parameters representing crossloading and that only the error covariance between e6 and e12 made substantive sense. Even a MI value of this size (8.499) is sensible to be included in the model. Not only that chi-square statistics became insignificant (p=.60) and the difference in $\chi 2$ was statistically significant $\Delta\chi 2$ (1)=9.6 (Table 5.9), but the theoretical ground for this improvement was found.

The two error correlations represented correlated measurement errors between item Q26.2 (IT management commitment toward SISP) and Q28.4 (scenario analysis) which address the dynamic dimension of SISP. According to the SISP literature (McBride, 1998), dynamic SISP is of paramount importance in the ever changing internal and external environments and commitment and involvement of IT management in addressing viability in plans is crucial. More and more IT executives use various tools to explore various scenarios to understand the consequences before making strategic decisions. Thus, these two items appear to elicit responses reflective of the current trend. This substantiated rationale gave us the bases for the inclusion of the error covariance between Items Q26.2 and Q28.4.

Table 5.9 Respecified a First-Order Six-Factor Measurement Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	PCFI
SISP – Respecified First-Order Six-Factor Measurement Model	52.428	38	0.060	1.38	0.018	0.967	0.932	0.924	0.038	0.563

Model	HOELTER 0.05	HOELTER 0.01
SISP - Respecified First-Order Six-Factor Measurement Model	264	303
Independence model	33	36

5.1.2.3.2 Post Hoc Analyses

The new, respecified model is schematically presented in Figure 5.6. The goodness of fit statistics showed improvement: $\chi 2=52.428$ is not significant ($p=0.60$), RMSEA dropped from 0.048 to 0.038, CFI increased from 0.963 to 0.977, NFI increased from 0.911 to 0.924. A review of all other parameters (including the error covariance between Items Q26.2 and Q28.4) showed that all estimates were reasonable and statistically significant. Most of the parameter estimates for the respecified model are shown in Appendix F; here we show Regression Weights and Standardised Regression Weights in Table 5.10 and Table 5.12 respectively.

Table 5.10 Regression Weights: SISP Respecified SISP Measurement Model

Item	Description	Estimate	S.E.	C.R.	P	Label
Q44.5	Time_Dimension	1.065	0.257	4.146	***	par_1
Q30.4	Technology	1.000				
Q20.5	Form & Content	1.000				
Q23.1	Form & Content	0.964	0.274	3.519	***	par_2
Q28.1	Viability	1.000				
Q28.4	Viability	0.813	0.157	5.175	***	par_3
Q24.4	Stakeholders'_Designation	1.000				
Q26.2	Stakeholders'_Designation	1.150	0.152	7.585	***	par_4
Q36.3	Collaboration	1.000				
Q36.4	Collaboration	1.006	0.209	4.817	***	par_5
Q18.5	Time_Dimension	1.000				
Q45.7	Technology	1.150	0.240	4.794	***	par_6

***p<0.001

Considering the substantially good fit of the model, and the lack of any considerable evidence of model misfit (residuals and MI), advice by Joreskog (1993) and MacCallum (1995) when to stop fitting the model was followed. Therefore, it was concluded that any further model improvement would lead to an overfitted model.

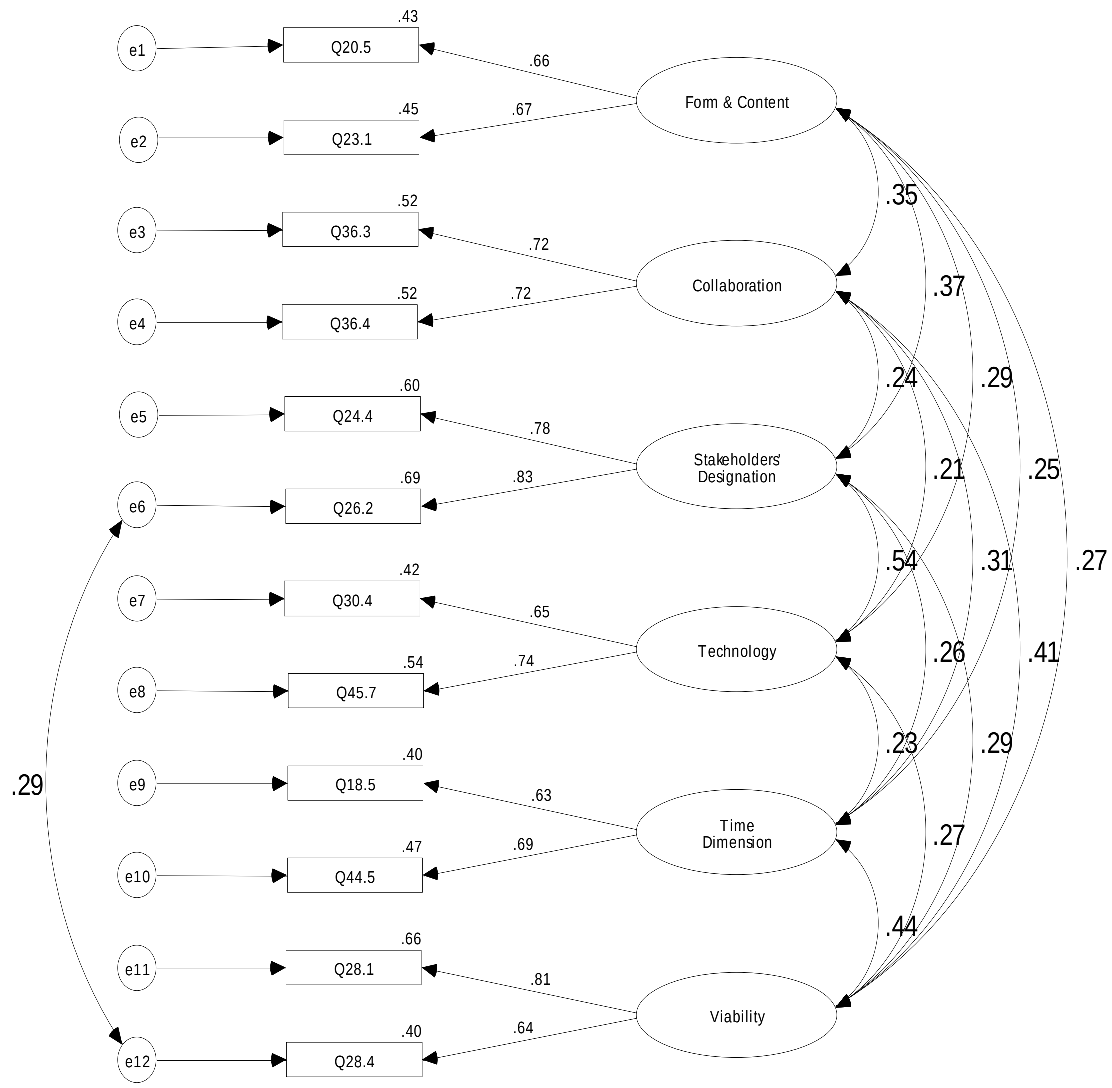


Figure 5.6 Final First-Order Six-Factor SISP Measurement Model

A formal comparison of $\chi 2$ values between the baseline (H2) model and the SISP maturity (H3) model strongly suggested that the H3 model was superior to the H2 model (Table 5.11) and the baseline model was rejected in favour of the more parsimonious first-order six-factor SISP measurement model.

Table 5.11 Goodness of fit statistics summary: - Hypothesis Comparisons

Model	Comparative Model	χ^2	df	χ^2/df	$\Delta\chi^2$	Δdf	p	GFI
Hypothesis 1 (H1): Single-Factor model	-	351.539	54	6.510	-	-	0.000	0.814

Model	Comparative Model	χ^2	df	χ^2/df	$\Delta\chi^2$	Δdf	p	GFI
Hypothesis 2 (H2): Tree-Factor model	H1	244.828	51	4.801	106.711	3	0.000	0.863
Hypothesis 3 (H3): Six-Factor model	H2	62.023	39	1.59	182.805	12	0.011	0.962
Hypothesis 3: Respecified Six-Factor model	H3	52.428	38	1.38	9.595	1	0.060	0.967

$\Delta\chi^2$, difference in χ^2 values between models; Δdf, difference in number of degrees of freedom between models; GFI, the Goodness of Fit Index

5.1.2.4 Testing for Factorial Validity of SISP subcriteria (First-Order CFA Model)

5.1.2.4.1 Test for Convergent Validity

The literature reports that regression weights (item loading on its specified factor) higher than 0.30 and significant at the 0.01 levels are considered as adequate indication of convergent validity (Anderson & Gerbing, 1988).

Table 5.12 lists all the standardised factor loadings as they appeared from the AMOS output. It can be seen that all loadings were substantially high and statistically significant (Table 5.10). These results provided good support for the convergent validity of the SISP subscales for the population utilized in this study. The estimates of standard error (SE), critical ratio (CR) and probability level (p) for regression weights and other statistics are shown in Appendix F.

Table 5.12 Estimates: SISP First-Order Six-Factor Respecified Measurement Model

Item	Description	Estimate
Q44.5	Time_Dimension	0.685
Q30.4	Technology	0.647
Q20.5	Form & Content	0.656
Q23.1	Form & Content	0.667
Q28.1	Viability	0.815
Q28.4	Viability	0.636
Q24.4	Stakeholders'_Designation	0.777
Q26.2	Stakeholders'_Designation	0.829
Q36.3	Collaboration	0.724
Q36.4	Collaboration	0.723
Q18.5	Time_Dimension	0.630
Q45.7	Technology	0.736

5.1.2.4.2 Test for Discriminant Validity

The test for discriminant validity was performed in two ways. As indicated early, a CFA test was undertaken using AMOS. The six-factor solutions using a PAF followed by oblique rotation was extracted. As shown on the Scree Plot (Figure 5.5) and Structure matrix (Figure 5.7), there were six distinct factors, with no crossloadings which was indication of a strong factorial structure and support for the hypothesised six subscales of SISP.

Structure Matrix

	Factor					
	1	2	3	4	5	6
Q26.2	.825					
Q24.4	.788					
Q36.3		.729				
Q36.4		.725				
Q20.5			.767			
Q23.1			.596			
Q45.7				.757		
Q30.4				.651		
Q18.5					.701	
Q44.5					.620	
Q28.4						.790
Q28.1						.671

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

Figure 5.7 SISP CFA: Structure Matrix Using Oblimin Rotation

A close examination of the Factor Correlation Matrix (Table 5.13) explicated the low correlation between the factors. The lowest correlation was between Stakeholder's Designation and Collaboration (0.161) and the highest between Stakeholder's Designation and Technology (0.413). This was clear evidence of discriminant validity as the different constructs were not significantly related to each other which demonstrated that the factors measured quite different aspects of SISP.

Table 5.13 Factor Corelation Matrix: SISP First-Order Six-Factor Measurement Model

Factor Correlation Matrix

Factor	1	2	3	4	5	6
1	1.000	.161	.303	.413	.198	.239
2	.161	1.000	.274	.203	.255	.307
3	.303	.274	1.000	.215	.174	.221
4	.413	.203	.215	1.000	.196	.175
5	.198	.255	.174	.196	1.000	.284
6	.239	.307	.221	.175	.284	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

A complementary test of discriminant validity was conducted following the steps suggested by Anderson and Gerbing (1988). The $\Delta\chi2$ for the 15 constrained models with $\Delta\chi2$ for the 15 unconstrained models was compared. The constrained models had the correlation between each pair of factors constrained to 1.0, and the test was performed on one pair of factors at a time.

Table 5.14 Discriminant validity test: SISP First-Order Six-Factor Measurement Model

Test	Estimate	C.R	Unconstrained Model $\chi2$	Constrained Model $\chi2$	$\Delta\chi2$
Form & Content with					
Technology	0.249	1.85**	4.046	52.402	48.356
Time Dimension	0.216	1.699**	1.501	49.763	48.262
Viability	0.282	2.763*	1.188	49.084	47.896
Stakeholders' Designation	0.371	4.331***	1.587	46.142	44.555
Collaboration	0.347	3.84***	0.496	45.197	44.701
Technology with					
Time Dimension	0.207	1.954**	0.001	49.439	49.438
Viability	0.259	2.676*	0.037	60.509	60.472
Stakeholders' Designation	0.524	7.122***	1.403	43.400	41.997
Collaboration	0.184	1.425**	2.675	65.182	62.507
Time Dimension with					
Viability	0.446	5.088***	2.020	39.067	37.047
Stakeholders' Designation	0.270	3.105**	0.035	47.897	47.862
Collaboration	0.317	3.443***	0.766	45.824	450.058
Viability with					
Stakeholders' Designation	0.317	3.68***	1.057	72.497	71.44
Collaboration	0.382	4.437***	0.301	64.448	64.147
Stakeholders'					

Test	Estimate	C.R	Unconstrained Model $\chi 2$	Constrained Model $\chi 2$	$\Delta\chi 2$
Form & Content with					
Designation with					
Collaboration	0.195	2.086**	0.296	80.286	79.99

*** p<0.001; ** p<0.05; * p<0.01

As shown in Table 5.14, all $\Delta\chi 2$ were significant at a *p* value as indicated in Table 5.14. A significantly lower $\chi 2$ for the unconstrained model suggested that each subscale captured a unique aspect of SISP, which supported the discriminant validity of the subscales.

5.1.3 SEM: Testing Measurement Model (Second Order CFA model)

The existence of the second order factors which explains the correlation among the six first-order factors was postulated in Chapter 2 and 4. The second-order model is special case of the first-order model (Byrne, 2001) and given the same number of estimable parameters, the fit statistics will be equivalent. Having a specification of the higher order factor, with the added restriction that the structure be imposed on the correlational pattern among the first-order factors will result in the goodness of fits which will never be better than a first-order specification. The three second-order factors (Efficiency, Effectiveness and Manoeuvrability) will govern the covariation among the first-order factor in a more parsimonious way (i.e., with more degrees of freedom). Already estimated parameters of factor loadings and measurement error variances (from the measurement model) were kept fixed in the structural model to be able solely observe the second order latent-variable parameters. The error terms associated with dependant latent variables indicated that the portion of these variables that was not explained or predicted by the latent independent variables in that equation.

A chi-square difference test between a Second-Order Single-Factor measurement model and the Second-order Three-Factor measurement model was performed to confirm that a simpler model can be rejected (Kline, 1998). Then, the fit test of the Second-order Three-Factor measurement model was carried out.

Based on the $\Delta\chi 2$ (2) statistics which was 9.986 ($\Delta\chi 2$>3.84 is considered significant) it can be said that the fit of a Second-Order Single-Factor measurement model was significantly worse than that of the Second-Order Three-Factor measurement model

(Table 5.15). Thus, the study continued with the assessment of a more complex model (Figure 5.8).

Table 5.15 Nested Model Comparisons

Assuming model 'SISP Second Order Three Factor Measurement Model' to be correct:							
Model	**DF**	**CMIN**	**P**	**NFI Delta -1**	**IFI Delta-2**	**RFI rho-1**	**TLI rho2**
SISP Second Order One-Factor Measurement Model	2	9.986	0.007	0.014	0.016	0.011	0.012

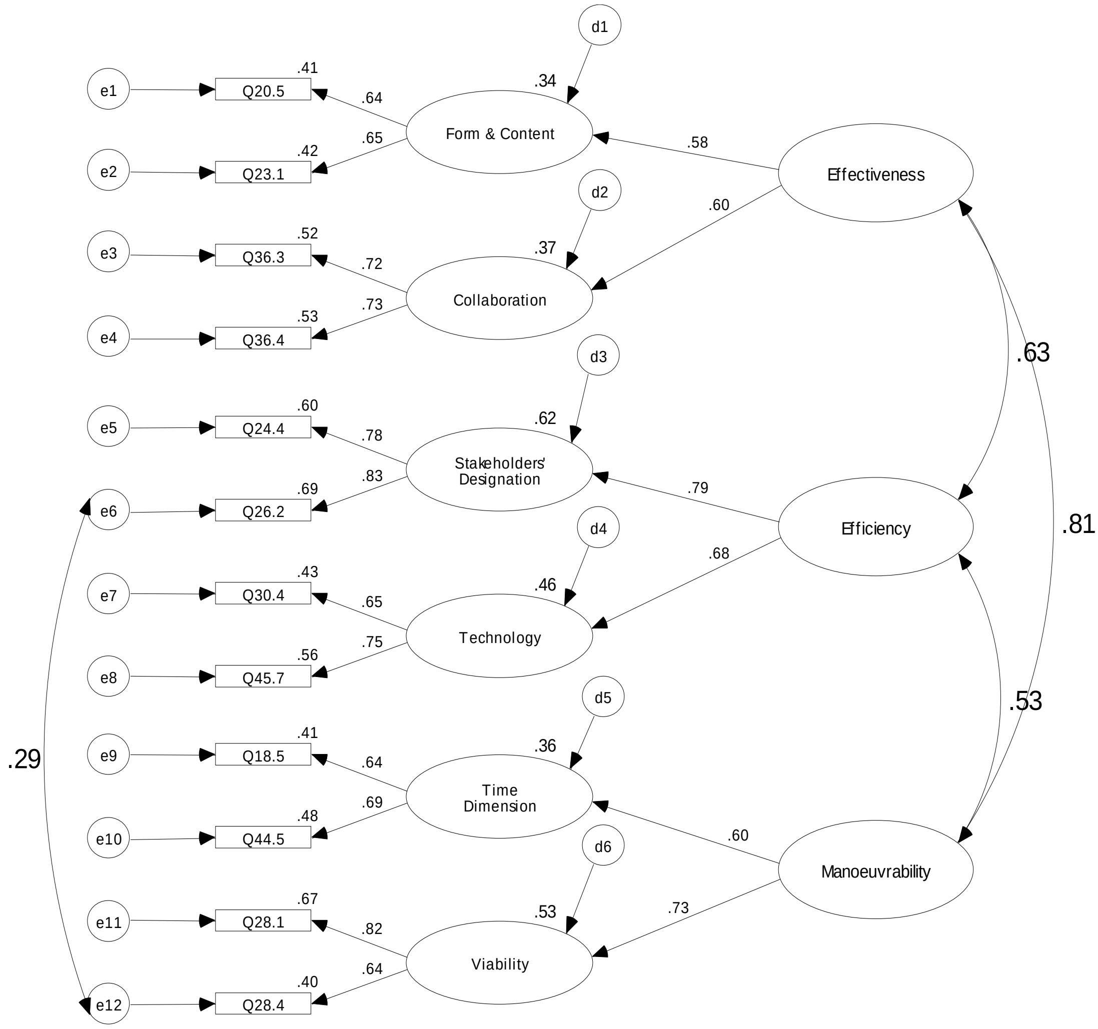


Figure 5.8 Second-Order Three-Factor SISP Measurement Model

Table 5.16 summarised fit statistic for the second-order three-factor measurement model with constrained first-order parameters.

Table 5.16 A Second-Order Three-Factor SISP Measurement Model Fit Summary

Model	χ^2	**DF**	**P**	χ^2**/DF**	**RMR**	**GFI**	**AGFI**	**NFI**	**RMSEA**	**PCFI**
SISP – Second-Order Three-Factor Model	57.282	62	0.646	0.924	0.021	0.964	0.932	0.917	0.000	0.939

Model	**HOELTER 0.05**	**HOELTER 0.01**
SISP – Second-Order Three-Factor Model	368	411
Independence model	33	36

As expected, the parsimony indicator was improved and a review of all other parameters showed a substantially good fit of the model, and lack of any considerable evidence of model misfit (residuals and MI). The parameter statistics is shown in Appendix F.

The strong correlations between Effectiveness, Efficiency and Manoeuvrability, demonstrate that the three constructs belong to a larger construct (SISP success) but they still capture quite different aspects of the SISP process and content (correlation <0.85).

5.2 SEM: Testing the Structural Model (Third-Order Model)

The study has demonstrated that the measurement portion of the structural equation model shown in Figure 5.9 represents a substantively reasonable fit to the empirical data. Now, the assessment of the structural portion of the full model is required. The primary objective of this assessment is to determine the relationships among only latent variables and the extent to which these relations are valid.

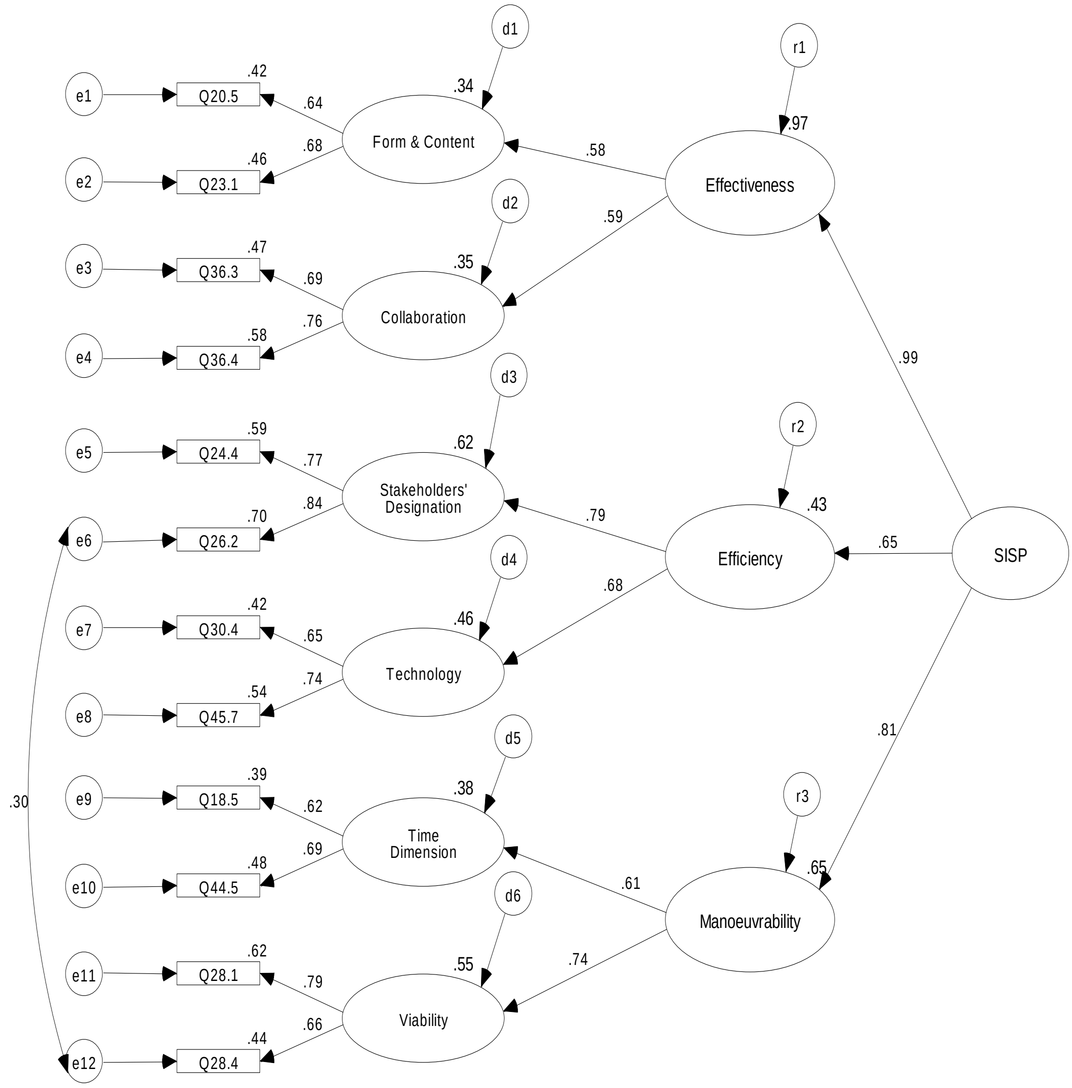


Figure 5.9 Hypothesized Model of SISP Maturity: Measurement and Structural Components

As can be seen from the statistics shown in Appendix F, the minimum was achieved in reaching a convergent solution; there were 65 parameters, from which 34 were free (to be estimated) and 78 distinct sample moments. The degree of freedom (78-34) was 44. The goodness of fit summary is shown in Table 5.17.

Table 5.17 SISP: A Full Structural Equation Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	PCFI
SISP – A Full Structural Equation Model	56.157	44	0.103	1.276	0.021	0.965	0.937	0.919	0.033	0.654

Model	HOELTER 0.05	HOELTER 0.01
SISP Maturity - Full SAM Model	279	317
Independence model	33	36

A review of the information provided in Table 5.17 indicated that the model fitted the data very well. A review of the modification indexes showed that there were no outstanding values that suggesting a model misfit. This was expected as the measurement model was performing satisfactorily. For the full model, the expected cross-validation index (ECVI) was examined to assess the potential for replication (Appendix F). This model had the lowest value of this index in comparison with the saturated and the independence models or any other hypothesized model, thus has the greatest potential for replication. The structural path and the regression weights are shown in Figure 5.9. But before assessing the structural path parameters it is a requirement (Byrne, 2001) to verify that this model complies with the assumption of normal data distribution.

The questionnaire survey data were not completely normal. Kurtosis values ranged between 0.594 and 2.383 and skewness between -0.015 and 2.094. The Multivariate kurtosis value of 23.398 was Mardia's coefficient which meant there was significant kurtosis, i.e. significant non-normality. An attempt to transform the data failed, as the results were not satisfactory in eliminating the skewness and kurtosis. It was decided to use the raw data despite its non-normality. To account for this departure from normality, bootstrapping statistics were used to prove the adequacy of the proposed model. Bootstrapping allowed the assessment of the stability of the parameters based not on assumptions of normality but on empirical resembling with replacement of the data, and thus reported parameter values with a greater degree of accuracy. If the Bollen-Stine bootstrap parameter p is less than, then 0.05, the model is rejected (Byrne, 2001). The following is a line from the report obtained from the AMOS output where the Bollen-Stine Bootstraping option was selected: 'Testing the null hypothesis that the model is correct, Bollen-Stine bootstrap p = 0.253'. An excellent p value gives the needed credibility for not rejecting the proposed model.

It is noted that the value of the parsimony adjusted Comparative Fit Index is 0.654 (cut off PCFI greater than 0.50) and was significantly lower than the measurement model reflecting additional complexity, but is still above the cut off point. The model parsimony was assessed by checking whether there were any paths that may be irrelevant to the model. The statistical significance of all structural parameter estimates was examined (Appendix F). It was found that all of them were statistically significant (CR>1.96).

The Square Multiple Correlations is a statistic which is independent of the units of measurement and represents the proportion of the variance that is explained by the predictors of the variable. For example, 97.2% of variance associated with Effectiveness was accounted for by its predictors, namely Form & Contents and Collaboration. The other R2 values were reasonably high (Table 5.18) indicating that the model is accounted for a sufficient proportion of the variance.

Table 5.18 The Square Multiple Correlations for Structural Paths

Factors	Estimate
Effectiveness	0.972
Manoeuvrability	0.654
Efficiency	0.426
Time_Dimension	0.375
Collaboration	0.352
Stakeholders'_Designation	0.624
Viability	0.547
Technology	0.460
Form & Content	0.340

The standardised regression weights for all structural paths were in the same direction and varied in intensity from 0.593 to 0.9860. They were statistically significant and well above the cut-off point of 0.30. As shown in Table 5.19 the relative contribution of the main criteria to the SISP was comparable with the results received when using the Super Decision software and the ANP/AHP model. The factor loadings confirmed stronger relationships between SISP and Effectiveness than between SISP and Efficiency or Manoeuvrability. Also, the importance of Manoeuvrability was more favourable than Efficiency; confirming the underlining theory.

Effectiveness and Efficiency are well recognised constructs of the planning activity and the obtained regression weights were consistent with the findings of other researchers. However, Manoeuvrability as a measure of planning dynamics has not been acknowledged in the literature as an equally important planning construct. One very important finding of this study is confirmation of a strong correlation between Manoeuvrability and SISP maturity.

As can be seen, there were no latent factors which should be dropped confirming that they all significantly contributed to mature SISP. The standardised factor loadings are shown in Table 5.19.

Table 5.19 Standardized Regression Weights- SISP maturity– full model

Item/Factor	Factor	Estimate
Efficiency	SISP	0.653
Manoeuvrability	SISP	0.809
Effectiveness	SISP	0.986

Item/Factor	Factor	Estimate
Stakeholders'_Designation	Efficiency	0.790
Form & Content	Effectiveness	0.583
Technology	Efficiency	0.678
Viability	Manoeuvrability	0.740
Time_Dimension	Manoeuvrability	0.613
Collaboration	Effectiveness	0.593
Q23.1	Form & Content	0.679
Q30.4	Technology	0.647
Q24.4	Stakeholders'_Designation	0.768
Q26.2	Stakeholders'_Designation	0.839
Q36.3	Collaboration	0.687
Q36.4	Collaboration	0.763
Q18.5	Time_Dimension	0.621
Q44.5	Time_Dimension	0.695
Q28.1	Viability	0.786
Q28.4	Viability	0.661
Q20.5	Form & Content	0.644
Q45.7	Technology	0.736

$p<0.001$

The high intensity of the standardised factor loadings for the second-order constructs provided the empirical evidence of adequacy of the underlying theory. The ranks of these constructs were comparable with the result obtained through the assessment model using ANP/AHP theory that is discussed in Chapter 4. In regard to the contributions of the first order constructs (subcriteria) to SISP, the underlying data favour Stakeholders' Designation and Viability latent factors.

The examination of all the other estimates provided an important insight into SISP planning within the sampled organisations. The statistical findings depicted an overall picture of SISP maturity in Australian organisation. From the regression, weights it could be seen which factors are dominant and in general terms we can conclude that SISP maturity is somewhere between levels 3 and 5. More precise analysis (in percentage terms) was not possible. Nevertheless, the assessment by ANP/AHP gave us more a comprehensible picture, which is discussed in more details in the next Chapter.

The results from the assessment model showed that successful SISP heavily depends on commitments from the top management level (weights are 0.768 and 0.839). Generally speaking, organisations have established a sound IT infrastructure, and IT departments are technically strong, but still IS technology is one of the issues where organisations spend too much efforts. The results also indicate that more and more organisations have less emphasis on a Form and Contents of SISP plans and that they are more concerned about the time dimensions of planning. SISP starts to be principally driven by business needs and acts as an agent for adhesion for internal functions. This trend is strong, but still organisations are far from achieving the top level of SISP maturity.

Overlapping maturity levels are evident when the standardised weights of the constructs are ranked and compared with the construct ranks in the postulated theory (Table 5.20). It can be concluded that there was no clear cut among levels or in other words, the underplaying data doesn't support one dominant stage of SISP maturity in Australian organisations. While having Stakeholder's Designation ranked at the top position, the second ranked Viability subcriteria indicated that organisations are aware of the new trends and to some extent traditional planning incorporate elements of adaptable planning. This finding is not a surprise, it is something that could be anticipated as similar findings are well founded in the literature (Ward and Griffiths, 1998).

Table 5.20 SISP Construct Ranking: SEM versus AHP

Factors	**SEM Regression Weights**	**Attainable Planning (ANP/AHP Rank)**	**Sustainable Planning (ANP/AHP Rank)**	**Adaptable Planning (ANP/AHP Rank)**
Stakeholders'_Designation	1	1	2	4
Viability	2	5	5	1
Technology	3	4	6	5
Time_Dimension	4	3	3	2
Collaboration	5	6	4	3
Form & Content	6	2	1	6

These results are very much in agreement with the results obtained through the assessment model using ANP/AHP theory in Chapter 4.

5.3 Conclusion

Structural Equation Modelling supported the adequacy of the proposed SISP maturity theory. The use of SEM has contributed to the overall confidence in the definition of SISP as multi-order, multidimensional constructs structure. SEM confirmed that the sample data fitted the model hypothesized by the six first-order latent factors that explained the three second-order latent variables identified as Effectiveness, Efficiency and Manoeuvrability.

Kline (1998) suggested that SEM is more useful for rejecting false models and that all models have equivalent or alternative models. For that reason, the study addressed parsimony in number of ways: (1) it explained the reasons for the rejection of simple models (2) reported fit coefficients which reward parsimony to adjust for the tendency of a higher apparent fit because of fewer observed variables per latent factor (3) tested for non significant parameters or paths that may be irrelevant to the model (which should be deleted from the model in the interest of parsimony).

All statistical parameters showed substantially good fit of the model, and there was a lack of any considerable evidence of model misfit. The internal consistency measured by Cronbach's alpha and the construct validity assessed through convergent and discriminant validity were substantiated by the six SISP subscales for the survey data.

A full comparison of results achieved by ANP/AHP and SEM was not possible as SEM statistical software imposes limitation on the number of variables for analysis in regard to sample size. Still, results were comparable and the applicability of the ANP/AHP theory was verified.

Even though there are no published SEM details to compare the results of this study, these findings have a comparable ground with the findings of previous works (Segars et al., 1998; Lederer and Salmela, 1996; Galliers and Leidner, 2003) in regard to the Efficiency and Effectiveness constructs. Also, the study empirically confirmed the existence of a third dimension, Manoeuvrability that captures the dynamics of the SISP.

This Chapter and previous ones dealt with the main research question of how can the maturity level of SISP be modelled. The next chapter tests the hypothesis and answers the secondary research questions.

CHAPTER 6

6 DATA ANALYSIS

6.1 Introduction

Chapter 4 presented the model of SISP maturity and Chapter 5 confirmed that the empirical data fit the model by means of SEM. Thus these chapters provided the answer to the research question of how the maturity level of SISP can be modelled. Chapter6 determines the actual degree of SISP maturity in Australian organizations and answers the other secondary research questions.

Chapter 6 starts with the data preparation and after analysing the characteristics of the responses, respondents and companies the degree of SISP maturity in Australian organizations is discovered. Chapter 6 then focuses on the analysis of specific relations among variables to answer the key reasons for SISP implementation success/failure.

In many SISP studies, variables are not expressed as measurable items. The content of the relations between variables is not presented but just discussed in broad terms. This study adopts a ‘micro analysis’ to show variables at the item level. Thus, this chapter provides a comprehensive assessment of the content of the relationships between the constructs of SISP structure. These relationships are discussed with respect to SISP maturity stages, SISP success and company size where appropriate. Analysis is provided by means of frequency, crosstabulation and bivariate correlation statistics. In this Chapter, all the hypothesises defined in Chapter 2 are tested. A comparative analysis with the findings of other researches is conducted. At the end, an analysis of the SISP measurement practice in Australian organizations is provided.

6.1.1 Data Preparation

Missing data and outliers are not a problem in this study; a few missing points in two questionnaires are substituted with mean values.

Table 0.1 in Appendix E lists the scales against which initial items (variables) are checked for inter-correlation using principal component factor analysis (PCA). Principal component analysis with varimax rotation is performed to select perspectives (factors) based on following criteria (Byrne, 2001): (1) significance of item loading (only items with factor loading greater than 0.4 are retained); (2) no crossloadings (an item can load significantly only on one factor); (3) parsimony of factor solution – single-item factors should be avoided.

Alpha, KMO and total variance explained are reported. Also, items which are dropped to increase the scale reliability are shown in that table. The total variance extracted in some instances shows that there are still unexplained variances. Although some scales are not particularly strong, they are still adequate in capturing the characteristics of the underlying factors.

6.2 Response Analysis

From a population of 2000 questionnaires sent, 66 questionnaires were returned to sender because of change of address and 15 companies responded with an apology letter that they were not able to participate in the survey due to various reasons (too busy, too many survey requests caused the adoption of a policy of not responding to surveys, unable to participate due to confidential nature of information required, subsidiary of overseas company and no input in SISP, etc.). 86 surveys were received from organisations that do not perform SISP. They supplied valuable data about their company itself which is used to analyse the characteristics of organisations that do not perform SISP. For a large number of questionnaire surveys, there were no responses. Still, a reasonable number of questionnaires (260) with complete data were received, representing a 17.3% response rate. This response rate is considered very high as the chosen method of collecting data usually has a low response rate (Kress, 1988).

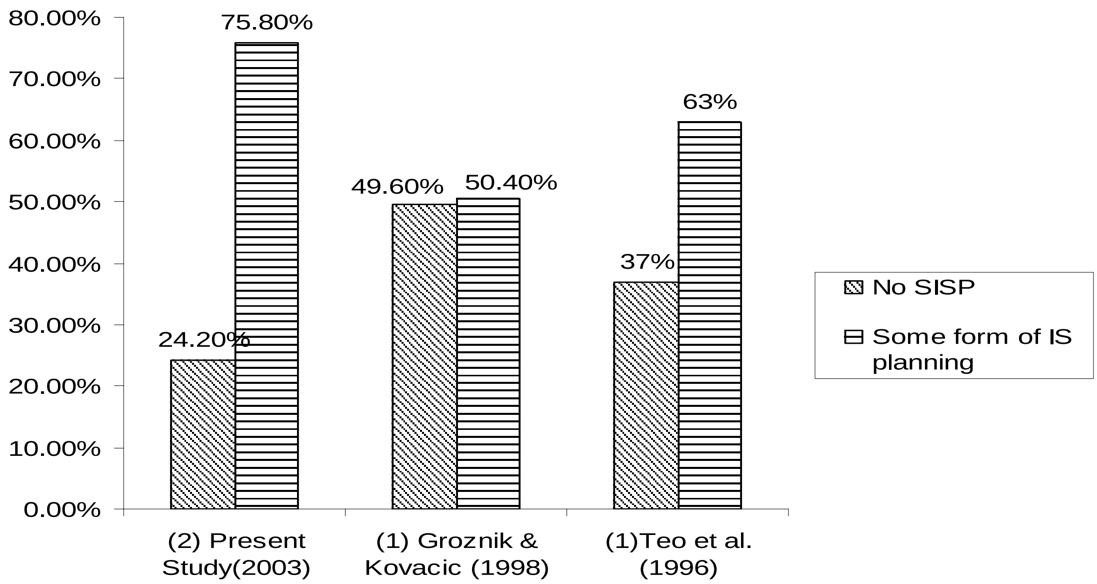
Table 6.1 shows that about 24% of Australian organisations do not perform SISP at all.

Table 6.1 Frequency of Undertaking SISP

		Responses		**Percent of Cases**
		N	Percent	
	No formal SISP	86	24.20%	24.90%
	Some Information Systems Planning	83	23.30%	24.00%
	Some Strategic Information Systems Planning	101	28.50%	29.20%
	Developing SISP	40	11.30%	11.60%
	Regular SISP	45	12.70%	13.00%
Total		355	100.00%	102.60%

Dichotomy group tabulated at value 1.

For comparison purposes, Figure 6.1 is provided. This figure shows the levels of planning in Europe (Slovenia), (Groznik & Kovacic, 2000) and Asia (Singapore), (Teo et al., 1997). There is a significant time difference between this study and other studies. Also, other studies (Figure 6.1) refer to some form of 'Strategic' IS planning, while this study differentiates between IS and Strategic IS planning (75.8 % includes both). Therefore, the result that SISP in Australia is more often exercised is indicative but not conclusive as the results are not fully comparable.



((1) Some form of Strategic IS planning (2) Some form of IS planning

Figure 6.1 Comparison: Undertaking Some Form of Information Systems Planning

A study of information systems planning in companies in Australia (Falconer and Hodgett, 1996) indicated that 19%, 29%, and 58% of small (n=96), medium (n=102), and large (n=96) organisations respectively prepare an Information System plan, which can be expressed as an average of 26.18% rate.

This study found that about 17% of organisations (Table 6.2) that attempt IS planning in Australia, perform Strategic IS planning regularly, 15% of them were developing SISP at the time the survey was conducted, 38% have irregular SISP, while about 31% of organisations have some form of IS planning.

Table 6.2 Frequencies of SISP– Excluding Organizations which do not Perform SISP

		Responses		**Percent of Cases**
		N	Percent	
	Some Information Systems Planning	83	30.70%	31.70%
	Some Strategic Information Systems Planning	101	37.60%	38.90%
	Developing SISP	40	14.90%	15.40%
	Regular SISP	45	16.80%	17.40%
Total		269	100.00%	103.40%

6.3 Characteristics of Organisations that do not Perform SISP

To obtain a complete picture of SISP in Australian organisations, it is important to know the characteristics of organisations that do not undertake SISP and the reason for not doing it. The following analysis is based on a sample of 86 companies which provided company details and declared that they do not perform SISP.

6.3.1 Company Locations

The geographical distribution of companies which do not have SISP is shown in Table 6.3. The sample surveyed showed that 46.7% of organisations have their business spread over more than one state. The total percentages of the geographical distribution for small, medium and large companies which do not undertake SISP are shown in Table 6.3. The responses received show adequate coverage for all states. A comparison between this data and the data for companies that undertake SISP is discussed in the next section.

Table 6.3 NO SISP: Company Size versus Location

	Small (<$10 M) **18.6%**	**Medium** ($10 to $500)M **79.1%**	**Large** (>$500M) **2.3%**	**Total 146.70%**	**Total 100%**
NSW		41.9%		41.9%	28.6%
WA		7.0%		7.0%	4.8%
VIC	11.6%	46.5%	2.3%	60.5%	41.3%
TAS		4.7%		4.7%	3.2%
QLD	2.3%	14.0%		16.3%	11.1%
ACT		2.3%		2.3%	1.6%
SA	2.3%	4.7%		7.0%	4.8%
NT	2.3%	4.7%		7.0%	4.8%

The size of a company is defined as small for an annual turnover of less than $10 million, medium for turnover between $10 and $500 million and large for turnover more than $500 million.

6.3.2 Industry Type and Size by Turnover

The influence of organisational size on IS planning is widely investigated (Premkumar and King, 1994). Only a few researchers observed a weak relationship between organisational sizes and IS planning. The majority of the findings were positive. Large organisations have the need for more formal planning and usually produce better quality IS plans. This is why organisational size is used as a control variable, where appropriate to assess the different aspects of SISP in Australian organisations.

According to Table 6.3, only 2.3% of large companies do not perform SISP; in other words, it is safe to state that large organisations perform strategic IS planning. The majority of ‘small’ companies who do not perform SISP are from the retail trade. The overall percentage of small ‘No SISP’ companies is 18.6%, while the percentage of medium sized, ‘No SISP’ companies is 79.1% (Table 6.4). Also, the survey data shows that some sectors regardless of company size always performs SISP. An example is the Higher Education sector which is not listed as ‘Not’ performing SISP in Table 6.4 but is listed as performing SISP in Table 6.11.

Table 6.4 NO SISP: Company Size versus Industry Type

% of Total

		Company size by turnover			
		Small	Medium	Large	Total
Industry type	Consulting and technical services		7.0%		7.0%
	Mining or quarrying		4.7%		4.7%
	Electricity and gas supply	4.7%			4.7%
	Communication		7.0%		7.0%
	Public administration		2.3%		2.3%
	Transport and storage		4.7%		4.7%
	Research and development		2.3%		2.3%
	Wholesale trade		2.3%		2.3%
	Retail trade	9.3%	4.7%		14.0%
	Construction	2.3%	7.0%		9.3%
	Insurance		4.7%		4.7%
	Banking/Finance		4.7%		4.7%
	Hospitality, personal and other services	2.3%	2.3%	2.3%	7.0%
	Health		4.7%		4.7%
	Retail		4.7%		4.7%
	Manufacturing		16.3%		16.3%
Total		18.6%	79.1%	2.3%	100.0%

Most of companies that do not attempt SISP either do not have a formal IT budget allocation or the budget is less than 1% of their total turnover. At least 16.3% of the medium size companies have an IT investment budget greater than 1% of total their turnover but they still do not perform SISP (Table 6.5).

Table 6.5 NO SISP: Company Size versus IT Investment

	Small (<\$10 M) **18.6%**	**Medium** (\$10 to \$500)M **79.1%**	**Large** (>\$500M) **2.3%**	**Total**
No formal budget allocation	14.0%	18.6%	2.3%	34.9%
IT investment spending < than 1% of total turnover	4.7%	37.2%		41.9%
IT investment spending 1% to 2% of total turnover		11.6%		11.6%

	Small (<$10 M) **18.6%**	Medium ($10 to $500)M **79.1%**	Large (>$500M) **2.3%**	Total
IT investment spending > 2% of total turnover		4.7%		4.7%
No Response		7%		7%

6.3.3 Industry Size by Number of Employees

Table 6.6 shows that small companies fall into the bracket of 20 to 99 employees and have less than 10 IS employees. The majority of medium companies fall into the bracket of 100 to 500 employees and still the majority of them have less than 10 employed in IT.

Table 6.6 NO SISP: Company Size versus No of Employees and No of IS Employees

		Company size by turnover			Total 100.0%
		Small 18.6%	**Medium** 79.1%	**Large** 2.3%	
Number of employees	< 20	4.7%			4.7%
	21 to 99	14.0%	14.0%		27.9%
	100 to 499		53.5%		53.5%
	500 to 999		9.3%		9.3%
	1000 to 4999		2.3%	2.3%	4.7%
Number of IS employees	< 10	18.6%	65.1%		83.7%
	10 to 20		11.6%		11.6%
	20 to 49		2.3%	2.3%	4.7%

Companies which do not perform SISP have less IS employees in comparison with companies which perform SISP (Table 6.13) regardless of their size. The number of IT personnel is very low in regard to the number of employees, in 84% of cases the number of IS employees is less than 10.

6.3.4 Industry: Other Characteristics

6.3.4.1 Dependency on IT/IS

The study assessed organisations that do not have SISP in terms of importance of IT/IS function for their business. Most of these companies (76.8%) have an IS/IT function critical to the business. Only 11.6% of them have their IT outsourced. A correlation chi-square test conducted for variables listed in Table 6.7 showed that there is no significant relations at a significance level of 0.05 between the variables related to dependency on IT and company size. The majority of this population (86%) does not see IT/IS as adding value to the business and that is probably the main reason why SISP is not undertaken.

Table 6.7 NO SISP: Company Size versus Dependency on IT/IS

	Small (<$10 M) **18.6%**	**Medium** ($10 to $500)M **79.1%**	**Large** (>$500M) **2.3%**	**Total**
IS/IT is distributed and NOT critical to the business	7.0%	14.0%		20.9%
IS/IT is distributed and is critical to the business	9.3%	34.9%		44.2%
IS/IT is centralized and NOT critical to the business		14.0%		14.0%
IS/IT is centralized and is critical to the business	7.0%	23.3%	2.3%	32.6%
IS/IT function outsourced	2.3%	9.3%		11.6%
IS/IT function is seen as adding value to the business	7.0%	7.0%		14.0%
IS/IT function is perceived as business enabler	7.0%	30.2%		37.2%
IS/IT function is perceived as business driver		4.7%		4.7%

About 45% of surveyed organisations which do not perform SISP, consider themselves as high tech, innovation-driven or knowledge intensive, yet they not attempt any kind of SISP (Table 6.8).

Table 6.8 NO SISP: Company Size versus Different Company Categories

		Small (<$10 M) **18.6%**	**Medium** ($0 to $500)M **79.1%**	**Large** (>$500M) **2.3%**	**Total**
High-Tech	Agree	4.7%	32.6%		37.2%
	Strongly Agree		7.0%		7.0%
Innovation driven	Agree	9.3%	39.5%	2.3%	51.2%
	Strongly Agree	2.3%	2.3%		4.7%
Knowledge intensive	Agree	7.0%	32.6%		39.5%
	Strongly Agree	2.3%	4.7%		7.0%
High e-business	Agree	2.3%	18.6%		20.9%
	Strongly Agree	2.3%	7.0%		9.3%
Solution integrator	Agree	4.7%	20.9%		25.6%
	Strongly Agree		2.3%		2.3%
Product consultant	Agree	4.7%	14.0%		18.6%
	Strongly Agree		7.0%		7.0%
No intention for e-trade	Strongly Disagree	2.3%	25.6%	2.3%	30.2%
	Disagree	4.7%	25.6%		30.2%
	Neither Agree or Disagree	7.0%	16.3%		23.3%

The reason for not performing strategic planning could be the fact that only 14% of no-SISP companies see the IS/IT function as adding value to the business. Also a very small percentage (4.7%) perceive the IS/IT function as business driver (Table 6.7). The majority of these organisations have adequate IT skills (Table 6.9), and 37.2% of them understand that IT is a business enabler (Table 6.7), but still they do not engage in strategic planning.

Table 6.9 NO SISP: Company Size versus Available IT Skills

	Small (<$10 M) **18.6%**	**Medium** ($10 to $500)M **79.1%**	**Large** (>$500M) **2.3%**	**Total**
Business analyst	7.0%	62.8%	2.3%	72.1%
Systems analyst	2.3%	60.5%	2.3%	65.1%
Information systems planner	4.7%	55.8%	0.0%	60.5%
Information analyst	4.7%	44.2%	2.3%	51.2%
General IT consultant	16.3%	67.4%	2.3%	86.0%
Project manager	9.3%	58.1%	2.3%	69.8%
Database administrator	11.6%	69.8%	2.3%	83.7%
Technical support/systems programmer	11.6%	65.1%	2.3%	79.1%

To summarise, a number of small and medium size companies have an IT function, that is critical to do business, have adequate IT skills, allocate a significant budget to keep up with IT/IS demands but see IT as necessary overheads to support day-to-day business activities and not as a function which adds value to the business.

6.4 Characteristics of Surveyed Organisations that Perform SISP

6.4.1 Company Locations

The geographic distribution of the surveyed companies is shown in Table 6.10. Some companies operate in more than one state, thus from the 260 cases there are 346 entries (133.1%). As can be seen, all Australian states are covered by this survey, with a percentage which is an acceptable representation of the population/industry in the states. In comparison with the location of "NO-SISP" companies, the major difference in distribution is for Australian Capital Territory (ACT), where most companies perform SISP and the Northern Territory (NT) where most companies do not perform SISP.

Table 6.10 Company Size versus Location

	Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total 133.1%**	**Total 100%**
NSW	2.3%	24.1%	11.5%	37.9%	28.4%
WA	1.1%	2.3%	4.6%	8.0%	6%
VIC	2.3%	24.1%	12.6%	39.1%	29.3%
TAS		2.3%	3.4%	5.7%	4.3%
QLD	3.4%	9.2%	4.6%	17.2%	12.9%
ACT	1.1%	6.9%	4.6%	12.6%	9.5%
SA	1.1%	4.6%	4.6%	10.3%	7.8%
NT		1.1%	1.1%	2.3%	1.7%

6.4.2 Industry Type and Size by Turnover

Table 6.11 shows the industry types that participated in the survey. The majority of respondents came from the manufacturing environment (18.4%), followed by public administration (11.5%), and banking/financial services (9.2%). Education, technical service organizations, and health were represented by 8% each. Utility organisations were represented with approximately 6.8% and the remaining 20% belongs to a variety of sectors. Industry types are grouped according to the size of the company. The size of the company is defined as small for annual turnover less than \$10 million, medium for turnover between \$10 and %500 million and as large for turnover more than \$500 million. The valid percentages obtained are: 5.7% for small, 62.1% for medium and 32.2% for large companies.

The size of the company is assessed not only according to turnover, but also according to IT investments, number of employees and most importantly by the number of IS/IT employees.

5.7% of respondents did not know the company's financial data (Table 6.12). The majority (33.3%) fall in the bracket of \$100 to \$500 M. Approximately 17% of the surveyed companies reported an annual turnover over \$1 billion.

It was possible to decode 5.7% of the 'don't know' responses according to the average results for employee numbers and investment spending. Thus, the corrected aggregated results carried forward in the analysis are shown in Table 6.12. The table also shows the IT investments as percentages of the total turnover and the IT investments as the percentage of the total investment budget.

Table 6.11 Company Size versus Industry Type

		Company size by turnover			Total
		Small	Medium	Large	
Industry type	Consulting and technical services	2.30%	5.75%		8.05%
	Mining or quarrying		1.15%	1.15%	2.30%
	Electricity and gas supply		1.15%		1.15%
	Communication	1.15%	1.15%	1.15%	3.45%
	Public administration		9.20%	2.30%	11.49%
	Transport and storage			2.30%	2.30%
	Education	1.15%	2.30%	4.60%	8.05%
	Research and development			1.15%	1.15%
	Wholesale trade		4.60%		4.60%
	Retail trade			1.15%	1.15%
	Construction		1.15%	1.15%	2.30%
	Agriculture, forestry or fishing		1.15%	1.15%	2.30%
	Insurance		1.15%	1.15%	2.30%

		Company size by turnover			Total
		Small	Medium	Large	
	Banking/Finance		4.60%	4.60%	9.20%
	Hospitality, personal and other services	1.15%	3.45%		4.60%
	Health		5.75%	2.30%	8.05%
	Retail		2.30%	1.15%	3.45%
	Manufacturing		12.64%	5.75%	18.39%
	Other		4.60%	1.15%	5.75%
Total		5.75%	62.07%	32.18%	100.00%

In some instances, similar questions are combined into a single question, mainly to reduce questionnaire length. Unfortunately, in the case where the goal was to know the percentage of spending on IT against total turnover and against total investment budget, with exception of two respondents, all others answered one or the other part of the question. The majority answers are related to total turnover. Even though, it is possible to relate the company size and IT investment.

Table 6.12 Company Size by Turnover

Company Turnover		**IT Investment Spending** (% of total turnover)		**IT Investment Spending** (% of total investment budget)	
< $1million	1.1%	No formal budget allocation	4.93%	1% to 5 % of total investment budget	40.78%
$1-$10m	4.6%	< than 1% of total turnover	14.95%	5% to 10% of total investment budget	40.78%
$11m to $20m	8.0%	1% to 2% of total turnover	53.41%	10% to 50% of total investment budget	14.89%
$21m to $50m	6.9%	> 2% of turnover	26.71%	> 50% of total investment budget	3.56%
$51m to $100m	10.3%				
$101m to $500m	33.3%				
$500M to $1billion	12.6%				
> $1billion	17.2%				

6.4.3 Industry Size by Number of Employees

An analysis of the survey data reveals that 46.0% of companies have 100 to 1000 employees and that 43.7% of the surveyed companies have less than 10 IS employees. Only 36.8% of companies have more than 50 IS employees where about half of these companies employ a more than 200 IS workforce.

Table 6.13 Company Size versus No of Employees and No of IS Employees

		Company size by turnover			Total 100.0%
		Small 5.7%	**Medium** 62.1%	**Large** 32.2%	
Number of employees	< 20		1.1%		1.1%
	21 to 99	2.3%	6.9%		9.2%
	100 to 499	2.3%	24.1%	1.1%	27.6%
	500 to 999	1.1%	14.9%	2.3%	18.4%
	1000 to 4999		12.6%	11.5%	24.1%
	5000 to 10000		1.1%	9.2%	10.3%
	> 10000		1.1%	8.0%	9.2%
Number of IS employees	< 10	4.6%	37.9%	1.1%	43.7%
	10 to 20	1.1%	8.0%	1.1%	10.3%
	20 to 49		5.7%	3.4%	9.2%
	50 to 99		6.9%	9.2%	16.1%
	100 to 199		3.4%	1.1%	4.6%
	> 200			16.1%	16.1%

Cross tabulation of employees and IT employees (Table 6.14) shows that 90% of companies with up to 500 employees have less than 10 IS employees, 43.24% of companies with 500 to 5000 employees have between 20 and 100 IS personnel, and 64.7% of companies with more than 5000 employees have more than 100 IS employees. The sampled data indicated that an average company size in employee terms is 807 employees with a mean of 19 IS personnel employed. The ratio between the total number of employees and IS employees in organisations that perform SISP was 2.32%.

Table 6.14 Number of Employees versus Number of IS employees

		Number of IS employees						Total
		< 10	10 to 20	20 to 49	50 to 99	100 to 199	> 200	
Number of employees	< 20	1.15%						1.15%
	21 to 99	9.20%						9.20%
	100 to 499	24.14%	3.45%					27.59%
	500 to 999	6.90%	3.45%	2.30%	4.60%		1.15%	18.39%
	1000 to 4999	2.30%	3.45%	5.75%	5.75%	2.30%	4.60%	24.14%
	5000 to 10000			1.15%	4.60%	1.15%	3.45%	10.34%
	> 10000				1.15%	1.15%	6.90%	9.20%
Total		43.68%	10.34%	9.20%	16.09%	4.60%	16.09%	100.00%

From Table 6.15, one can see that SISP experience is assessed mainly in medium size companies (62.1%) from which the majority (74.08%) have less than 20 IS employees.

There is no nice, clean cut to aggregate the data for employees, IS employees, total IT investment budget and total turnover. A very small percentage of companies do not fit into common ranges, thus the following table is not a one hundred percent accurate summary of the data obtained but it is still a very good approximation and useful overview.

Table 6.15 Company Size versus IT Investment, Number of Employees and IS Employees

	Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**
Employees (<500)	4.6%	32.1%	1.1%	37.8%
Employees (500 to 5000)	1.1%	27.5%	13.8%	42.4%
Employees (>5000)		2.2%	17.3%	19.5%
IS employees (<20)	5.75%	45.98%	2.30%	54.02%
IS employees (20 to 49)		5.75%	3.45%	9.20%
IS employees (>50)		10.34%	26.44%	36.78%
1% to 5 % of total investment budget	3.56%	22.33%	14.89%	40.78%
5% to 10% of total investment budget		22.33%	18.45%	40.78%
10% to 50% of total investment budget		7.44%	7.44%	14.89%
> 50% of total investment budget			3.56%	3.56%
< than 1% of total turnover		13.70%		13.70%
1% to 2% of total turnover	4.60%	20.70%	11.50%	36.80%
> 2% of turnover		11.50%	6.90%	18.40%

The literature review reports that SISP increases directly with the total number of employees (Teo et al., 1997; Groznik & Kovacic, 2000). This study tested that conclusion by means of the crosstabulations/Pearson chi-square. The existence of relationships (Chi-Square=31.722, df=6, $p<0.05$) was found in the case of the regular SISP planning. The Phi coefficient was 0.427 indicating a strong relationship. In organisations where ‘some’ SISP was reported, this relationship is not significant (Chi-Square=10.828, df=6, $p>0.05$, Phi=0.249) and ‘developing’ SISP organizations have this relationship significant but weak (Chi-Square=13.823, df=6, $p<0.05$, Phi=.282). Thus, organisation size in terms of number of employees is a significant antecedent for conducting SISP.

6.4.4 Industry: Other Characteristics

6.4.4.1 Dependency on IT/IS Structure

This study investigated the degree of dependency on IT/IS infrastructure or IT/IS applications to carry out core operations and manage business. As depicted in Table 6.16, Australian business is reliant on IT/IS. When the first 5 items were assessed using multiple responses statistic, it was found that 3.5% (2.6% for distributed and 0.9% for centralised IT/IS) of organisations were not critically dependant on IT/IS. Although this is a very small percentage, it is on the contrary expected that all businesses are critically dependent on IS/IT infrastructure. Also, IT/IS is still a more centralised function (46.2% versus 35% distributed). Medium and large companies outsourced their IT function in 10.3% percent cases. Bivariate correlations (Spearman's rho) statistic is performed to assess the existence of relationships between IT structure and size of organisations. Results obtained show that there are no relationships (Table 6.16). Outsourcing is related to the size of a company (Spearman's rho 0.21, significant at the 0.01 level).

Table 6.16 Company Size versus IS/IT Structure

	Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**	**Relationship** (Spearman's rho)
IS/IT is distributed and NOT critical to the business		1.7%	1.7%	3.4%	0.08 NC
IS/IT is distributed and is critical to the business	3.4%	25.3%	18.4%	47.1%	0.10 NC
IS/IT is centralized and NOT critical to the business			1.1%	1.1%	0.15 NC
IS/IT is centralized and is critical to the business	3.4%	41.4%	17.2%	62.1%	-0.10 NC
IS/IT function outsourced		10.3%	10.3%	20.7%	0.21*
IS/IT function is seen as making a value-added to the business	2.3%	18.4%	16.1%	36.8%	0.16**
IS/IT function is perceived as business enabler	2.3%	25.3%	25.3%	52.9%	0.34*
IS/IT function is perceived as business driver	2.3%	9.2%	9.2%	20.7%	0.08 NC

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.

Groznik & Kovacic (2000) and Teo et.al. (1997) reported contrary results regarding the relationships between IT organisational structure and SISP planning. The former reported the existence of a strong correlation and the latter no existence. This study examined that relationship.

Bivariate correlation was used to test the existence of a relationship between IT organisational structure and SISP planning (the existence of a regular planning, not SISP planning success). The findings are summarised in Table 6.17. A significant but negative relationship was found only in the case of ‘distributed and critical for business’ IT architecture and performing ‘regular’ SISP. This is a weak relationship. The overall result indicated that the underlying data do not support this type of relation.

Table 6.17 Relationship between IT Structure and SISP

	Relationship with SISP
IS/IT is distributed and not critical to the business	-0.09 NC
IS/IT is distributed and is critical to the business	-0.17 *
IS/IT is centralized and not critical to the business	-0.05 NC
IS/IT is centralized and is critical to the business	0.03 NC

** Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.

6.4.4.2 Perception of IS/IT Function

Perception about IT/IS function is very often discussed subject in the IS literature. Knowing that it can be biased by respondents' position in the company a crosstabulation was performed and the results are shown in Table 6.18. It is noticeable that a low percentage of respondents (36.8%) thought that IS/IT added value to the business, 52.9% thought that IS/IT is a business enabler, and only 20.7% thought of IT/IS as a business driver.

Table 6.18 Participant Position versus Perception of IS/IT Function

	Frequency	**Percent Valid**	**IS/IT function is perceived as business enabler** (52.9%)	**IS/IT is perceived as business driver** (20.7%)	**IS/IT is seen as making a value-added to business** (36.8%)
CEO	12	4.60%	50.00%*	50.00%*	75.00%*
CIO	87	33.33%	68.97%*	24.14%*	41.38%*
Information Systems Manager	93	35.63%	38.71%*	16.13%*	22.58%*
Divisional Manager	9	3.45%	33.33%*	33.33%*	100%*
Accounting Manager	9	3.45%	66.67%*	0.00%*	33.33%*
Financial Controller	12	4.60%	25.00%*	25.00%*	25%*
General manager finance & administration	38	14.94%	61.54%*	15.38%*	38.46%*
Total	260	100.0			

*Positive answer percentage calculated as a percentage of 'Percent Valid' column (relative percentage)

It is unexpected that only 22.58% of the surveyed Information Systems Managers and 41.38% of CIOs saw IS/IT as value-adding to the business. At the same time about 75% of CEOs perceived IT/IS as value-creating to the business. An exception was the Divisional managers, all of them saw IS/IT as value adding to the business, but their participation in this survey is only 3.45%. IT managers are even more sceptic when it comes to assessing IT/IS as business driver, only 20.14% of them thought that IT/IS actually drives business (calculated as an average from Table 6.18). When it comes to IS/IT as a business enabler, the picture is somewhat different; 69% of CIOs are positive about the enabling function of IT/IS but CEOs are still sceptical as 50% of them are of opinion that IT/IS cannot be even characterised as a business enabler.

The management of the surveyed companies perceived their organisations as high tech, innovation driven or knowledge intensive in the following percentage terms: 41.40%, 50.50%, and 75.90% respectively. According to Table 6.19, medium size companies are slightly more advanced than large organisations when it comes to all of these three attributes.

Table 6.19 Company Size versus Different Company Categories

		Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**
High-Tech	Agree	4.6%	10.3%	10.9%	25.9%
	Strongly Agree		9.2%	6.3%	15.5%
Innovation driven	Agree	1.1%	20.7%	18.4%	40.2%
	Strongly Agree	2.3%	4.6%	3.4%	10.3%
Knowledge intensive	Agree	2.3%	25.3%	18.4%	46.0%
	Strongly Agree	2.3%	19.5%	8.0%	29.9%
High e-business	Agree	2.3%	5.7%	9.2%	17.2%
	Strongly Agree		1.1%	1.1%	2.3%
Solution integrator	Agree	2.3%	13.8%	6.9%	23.0%
	Strongly Agree		1.1%	2.3%	3.4%
Product consultant	Agree	1.1%	2.3%	3.4%	6.9%
	Strongly Agree		1.1%		1.1%
No intention for e-trade	Strongly Disagree	4.6%	28.7%	18.4%	51.7%
	Disagree		17.2%	3.4%	20.7%
	Neither Agree or Disagree		9.2%	8.0%	17.2%

Table 6.20 displays the availability of IT skills. The highest percentages are against the User support roles and Network manager (96.6% and 95.4 respectively). In general, the larger percentages indicate that organisations have adequate IT skills to perform SISP.

Table 6.20 Company Size versus Available IT Skills

	Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**
Business analyst	1.1%	44.8%	29.9%	75.9%
Systems analyst	2.3%	50.6%	32.2%	85.1%
Information systems planner	2.3%	43.1%	29.9%	75.3%
Information analyst	2.3%	39.7%	29.9%	71.8%
General IT consultant	5.7%	48.9%	25.3%	79.9%
Project manager	3.4%	51.1%	31.0%	85.6%

	Small (<$10 M) **5.7%**	**Medium** ($10 to $500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**
Database administrator	4.6%	51.7%	32.2%	88.5%
Programmer	5.7%	48.3%	32.2%	86.2%
Network manager	5.7%	57.5%	32.2%	95.4%
User support	4.6%	60.9%	31.0%	96.6%
IS/IT trainer	3.4%	30.5%	25.3%	59.2%
Technical support/systems programmer	3.4%	52.9%	29.9%	86.2%

In the next sections, the study investigates the influence of technology on SISP and in Table 6.21 the availability of technologies is presented. It can be seen that very new applications just start to take ground in the business world as breakthrough technologies and applications are present in only 7.2% of organisations.

Table 6.21 Available Technologies/Applications

	Infrastructure/Application	**Percent of Cases**	**Total** 100%
Breakthrough Technologies/Applications	Nanotechnology	2.3%	
	Neural networking	3.4%	
	Expert Systems	10.3%	
	Virtual reality systems	1.1%	
	Voice recognition systems	18.4%	
	Extranet	48.%	
	Wireless third generation	20.7%	
			7.2%
Advanced Technologies/Applications	Wide area networks	80.5%	
	Decision support systems	43.7%	
	Distributed databases	40.2%	
	Data warehousing	60.9%	
	Data Mining	35.6%	
	Electronic Data Interchange	50.6%	
	Executive Information Systems	46.0%	
	Web based technology	66.7%	
	CASE technology	10.3%	
	4th Generation language	29.9%	
	Peer-to-peer network	29.9%	
	Multimedia - using high bandwidth networks	25.3%	
	Security & risk management infrastructure	87.4%	
	Application infrastructure is integrated	57.5%	
	Legacy applications are replaced by an integrated package	37.9%	
	Object oriented development environment	28.7%	
			50.6%
Traditional Technologies/Applications	Internet	97.7%	
	Intranet	93.1%	
	Wireless second generation	36.8%	
	Local area networks	97.7%	
	Client/server network	88.5%	

	Infrastructure/Application	Percent of Cases	Total 100%
	Relational Database	85.1%	
	Separate data, text, imaging, voice, video	50.6%	
	Application infrastructure is stand-alone	14.9%	
	Bar-code readers	46.0%	
			42.2%

In summary, most of the medium and large size companies have an IT function critical to do business, have adequate IT skills, allocate significant budget to keep up with IT/IS demands but still IT is not significantly perceived as a function which adds value to business.

The classification as small, medium and large companies is based on annual turnover figures alone. A disproportional small proportion of the small companies is noticeable. Keeping in mind that their SISP contribution is insignificant, the 5.7% presence of small companies is found adequate. So far the study has used frequency analysis to give some insights as to what is happening with small companies. Cluster analysis gives the opportunity to specify more sophisticated characterisation of companies by taking into consideration not only the size of the company by financial figures, but also the number of employees, number of IS employees, total investment budget and available IT budget. For that reason, the Hierarchical Cluster Analysis is performed. This procedure automatically standardizes scales to avoid the effect of differences in scaling on the cluster solutions.

Cluster analysis suggested two partitions: the cluster of small and medium companies together, and the cluster of large companies. The results produced by the cluster analysis are not significantly different from those previously obtained. Originally, it was 5.7%, 62.1% and 32.2% for small, medium and large companies respectively. Cluster analysis with four additional criteria gives 66.7% for small and medium companies and 33.3% for large companies. This proves that annual turnover is the predominant factor which is more important than all other attributes such as number of employees, IS employees, spending, etc. The study continues to use one or the other ‘dummy’ variable with respect to the aim, for example, to show important findings to small companies, ‘tree cluster’ dummy variables are used.

6.5 Characteristics of the Respondents

Table 6.22 shows that most of the respondents were college educated (88%). About 5% held CEO positions and 6.8% were divisional or operational managers (Table 6.18). The study targeted IT executive positions, thus the majority of positions comes from that position: approximately 69% of respondents held CIO or other IT/IS management positions, and about 19.5% of respondents were from a financial area.

Table 6.22 Respondents' Formal Tertiary Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	32	12.3	12.3	12.3
	Yes	228	87.7	87.7	100.0
	Total	260	100.0	100.0	

51% percent of respondents are working for the present company for more than 6 years (among them only 3.4% are over 20 years with the present company).

Approximately 39% of respondents had more than 20 years of industrial experience. Median and mean industrial experience was 16-20 years and only 6.9% of participants had been in the industry from 0-5 years. Average IS experience was in the range of 11-15 years, with a high percentage (31%) of more than 20 years of IS experience (Table 6.23). This indicated that the majority of respondents have very solid IT/IS experience.

Table 6.23 Respondents' Experience in IS Area and SISP

% of Total

		Experience in SISP					
		0-5 years	6-10 years	11-15 years	16-20 years	>20 years	Total
Experience in IS area	0-5 years	10.3%					10.3%
	6-10 years	14.9%	5.7%				20.7%
	11-15 years	5.7%	5.7%	1.1%			12.6%
	16-20 years	8.0%	8.0%	6.9%	2.3%		25.3%
	>20 years	5.7%	9.2%	10.3%	2.3%	3.4%	31.0%
Total		44.8%	28.7%	18.4%	4.6%	3.4%	100.0%

When it comes to a SISP experience the distribution is quite the opposite. Table 6.23 shows that the majority of respondents (44.8%) have 0-5 years of experience in SISP (mean of 6-10 years) and only 3.4% of more with than 20 years experience. Respondent's contribution to SISP is however significant. Only 1.1% of respondents did not have any involvement in the SISP process (percentages are shown in Table 6.25).

As indicated in Table 6.23 most of respondents have up to 10 years of SISP experience which translates to the fact that strategic IS planning in Australian organisations is not a very old practice. Only 8% of respondents have more than 15 years of SISP experience. This is an indication that SISP planning is a relatively young process in Australia and that practice could be still behind SISP theory.

As was previously indicated, this emphasis of the research is on the paramount importance of human knowledge and experience (Leidner, 2003). Contribution of knowledge is tested in many ways. Here, the experience in SISP is assessed versus position held and the results are shown in Table 6.24. As per expectation, CEOs are not greatly involved in the SISP process; however small percentages of those who are involved in this survey (4.6%) have adequate SISP experience and have fair involvement (Table 6.25) in the planning process. From a population of 68.9% of IT managers, 40.2% have more than 6 years of SISP experience.

Table 6.24 SISP Experience Distribution against the Position Held

% of Total

		Experience in SISP					
		0-5 years	6-10 years	11-15 years	16-20 years	>20 years	Total
Participant position in company	CEO	2.3%	1.1%	1.1%			4.6%
	CIO	13.8%	11.5%	8.0%			33.3%
	Information Systems Manager	14.9%	9.2%	4.6%	3.4%	3.4%	35.6%
	Divisional Manager	1.1%		2.3%			3.4%
	Accounting Manager	2.3%	1.1%				3.4%
	Financial Controller	2.3%	1.1%		1.1%		4.6%
	General manager finance & administration	8.0%	4.6%	2.3%			14.9%
Total		44.8%	28.7%	18.4%	4.6%	3.4%	100.0%

Also respondent's contribution to SISP versus respondent's position in the company is analysed and shown in Table 6.25. Only 1.1% of respondents did not have any involvement in SISP.

Table 6.25 Respondent's Contribution to SISP versus Position Held

% of Total

		Respondent's contribution to SISP				
		No contribution	Minor contribution	Fair contribution	Major contribution	Total
Participant position in company	CEO			2.3%	2.3%	4.6%
	CIO			5.7%	27.6%	33.3%
	Information Systems Manager		3.4%	3.4%	28.7%	35.6%
	Divisional Manager		1.1%		2.3%	3.4%
	Accounting Manager			1.1%	2.3%	3.4%
	Financial Controller	1.1%		1.1%	2.3%	4.6%
	General manager finance & administration		2.3%	4.6%	8.0%	14.9%
Total		1.1%	6.9%	18.4%	73.6%	100.0%

Having 92.0% of respondents being active contributors to SISP, with 81.6% of them having more than 11 years of industrial experience (39.1% more than 20 years), 89.6%

having more than 6 years experience in the IS area, and 50.5 % being with the present company for more than 6 years, gave full credibility and confidence to the survey answers.

6.6 Levels of SISP Maturity and SISP Success in Australian Organisations

The main secondary research task is to find the degree of SISP maturity in Australian organizations. Knowing where practise in Australian organisations sits in terms of SISP maturity is crucial as it gives directions of what and where theoretical and practical efforts should be focussed.

When the SISP assessment model with ratings is fed with raw data and the overall model synthesis is performed, the level of SISP maturity is obtained for each surveyed organisation according to the criteria/subcriteria defined in the previous chapters. 'Ideal' or bench mark scores are shown in Table 4.20. If an organisation scores between 0-0.036, it is on the Rudimentary level of planning; a score of 0.036 to 0.055 indicates Ineffectual Planning and scores between 0.055 and 0.116 points to Attainable Planning. To achieve Sustainable Planning, scores should be between 0.116 and 0.46. If an organisation has total weights of more than 0.46, that organisation is on its way to achieving the highest level of SISP maturity (Adaptable Planning).

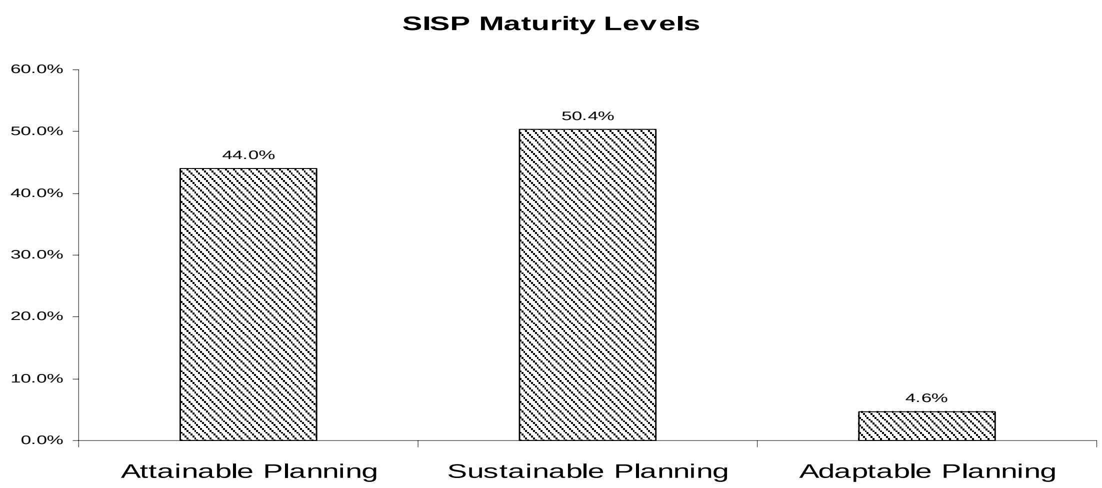


Figure 6.2 SISP Maturity Levels in Australia: Organizations which Attempted SISP

The sampled population showed (Figure 6.2) that the majority (50.4%) of Australian organizations that *attempted* strategic information planning are on SISP maturity level 4 (Sustainable Planning). The Attainable planning is present in 45.0% of organisations and 4.6% of organisations reached Adaptable planning. The results are also compiled for organisations that claimed to perform *regular* SISP (Figure 6.3). For those organisations the percentage of achieving Level 5 is significantly higher, it is 18%, while level 3 and level 4 achieved 30% and 52% respectively. There are no small companies that perform regular SISP. The ratio between large and medium companies who perform regular SISP is 2.4 in favour of large companies.

The empirical data graphically presented in Figure 6.2 and Figure 6.3 suggested a necessity for revision of the theoretical model. There is no support for the Rudimentary and Ineffectual levels of SISP maturity Australia wide, thus, it could be concluded that those phases are non-existent as organisations have evolved with technological advances. Wide spread information and the availability of knowledgeable resources enable even SISP starters to exercise more mature planning. This finding is supported in the SISP literature. Grover and Segars published in 2005 a study on an empirical evaluation of the stages of SISP. They collected data from the companies in the Eastern half of the United States approximately in the same year when this study collected data from Australia wide companies. Thus results between those two studies should be very comparable. Grover and Segars also found three stages of SISP evolvement. They called them: the Preliminary Stage, the Evolving and the Mature Stage. The distribution of percentages belonging to each stage is comparable too: 37% for the Preliminary Stage, 42% for the Evolving stage and 21% for the Mature Stage is very similar to 30%, 52% and 18% respectively obtained in Australia. This is a very important comparison as it adds a significant credibility to this study.

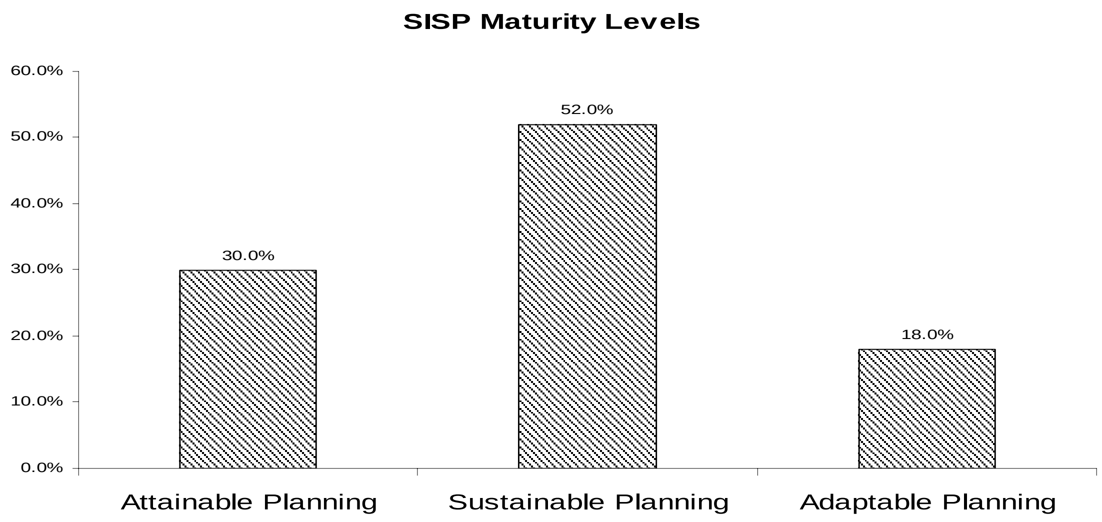


Figure 6.3 SISP Maturity Levels in Australia: Organizations which Perform Regular SISP

The assessment model and criteria are based on an exhaustive analysis of SISP literature, and validated by empirical data which reflect the reality of the practice. Thus, the results of the judgements based on the literature review and the application of ANP/AHP, operationalised as a single measure of SISP maturity stage, are compared with SISP success, and the results received from the questionnaires. Note that SISP success is measured implicitly and explicitly. Here the explicit measure is used, operationalised as a single item which measured the respondent's perception of the overall SISP success. It is acknowledged that this measure can be biased, but some other researches (Pyburn, 1983) did the same, they measured SISP success by directly asking the executives the questions about their perception of SISP achieving its objectives. Other studies confirmed the insignificant error between the use of a single overall measure of success from the respondent and a multi-item measure (Warr, 2006).

As in Earl's (2000) study, no criteria of SISP success are given to respondents in the questionnaire. Only 9.2% of respondents claimed that their SISP is very good (Table 6.26). The majority of them are neutral (55%) and 33.5% are satisfied with their SISP and only 2.2% dissatisfied. Lederer and Sethi (1999) reported in 1992 the overall satisfaction with SISP as being: 32% satisfied, 15% neutral, and 53% dissatisfied with a mean of 2.53. A decade after, it seems that satisfaction with SISP increased by only 10%, but the rate of dissatisfaction significantly dropped to 2.2%, i.e. the previous dissatisfaction with SISP now changed to 'neutral', thus the mean increased to 3.48 (st.dev. 0.727), with an overall of 19% increase in SISP success.

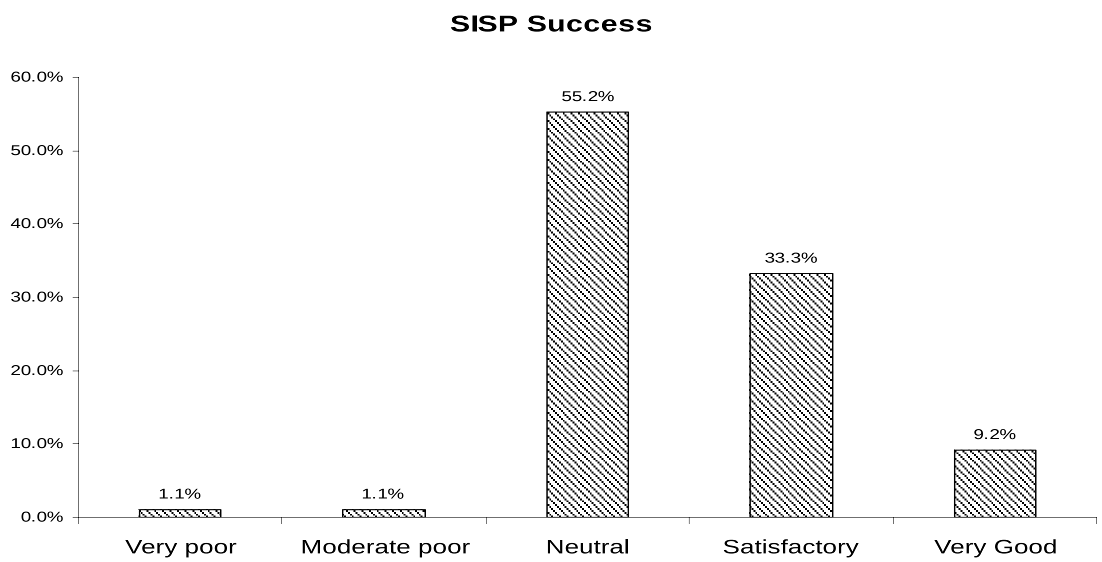


Figure 6.4 SISP Success in Australia: Organizations which Attempted SISP

Also, there are no negative perceptions about SISP success for SISP maturity levels 4 and 5. Table 6.26 demonstrates that the theoretical and empirical results are comparable in the sense that higher maturity levels of SISP result in more successful SISP. Expressed as percentage terms (for satisfactory and very good) SISP success for the Attainable planning level is 18%, 61%for the Sustainable level and 75% for the Adaptable planning level.

Table 6.26 SISP Maturity Levels and SISP Success Crosstabulation

		SISP Success					
		1*	2*	3*	4*	5*	**Mean**
SISP Maturity	3**	1.1%	1.1%	34.5%	6.9%	1.1%	**3.13**
	4**			19.5%	25.3%	5.7%	**3.73**
	5**			1.1%	1.1%	2.3%	**4.25**
Total		1.1%	1.1%	55.2%	33.3%	9.2%	3.60

*(1) Very poor, (2) Moderately poor, (3) Neutral, (4) Satisfactory, (5) Very good
** (3) Attainable Planning, (4) Sustainable Planning (5) Adaptable Planning

Thus, a monotonically increasing trend in the satisfaction of accomplishment of objectives through SISP maturity stages (bold text in Table 6.26) provides the evidence of the correctness of the theoretically established model. Even though Table 6.26 shows a clear pattern, to be sure that it is real and not due to chance, the relationship between SISP maturity levels and the overall SISP success is tested. This test should confirm/reject the hypothesis H13 defined in Chapter 2 as:

H13	As SISP evolves towards higher maturity levels, the level of planning success will increase.

A Bivariate correlation procedure was used to compute Spearman's rho correlation coefficient to assess the existence of a relationship between SISP success and SISP maturity levels. The correlation was significant at the 0.01 level (2-tailed). The value of Spearman's rho was 0.567, which indicates in this case a strong relationship between the two variables. Thus, the null hypothesis that there is no relationship between these two variables is rejected. To test the monotonically increasing trend in SISP success with the progress in the SISP maturity levels, ANOVA and descriptive statistics are used. The ANOVA test confirmed the difference in the means ($F=23.591$, $p<0.05$) and the descriptive statistics, shown in Table 6.27 demonstrate that the mean value has an increasing tendency with the advancement through the SISP maturity stages.

This is an important finding suggesting that the SISP maturity model can be confidently used in this study.

Note: all correlations were calculated taking in an account a sample of 260 cases. This population comprised organisations which attempted some kind of IS planning, i.e. regular or irregular SISP or prepared a simple IS plans. Only where indicated the analysis is performed on a sample that performed SISP regularly. Thus, in many instances the strength of correlation appeared lesser than if only the regular SISP companies were taken in an account.

Table 6.27 SISP Maturity Levels: Descriptive Statistics

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Attainable Planning	117	3.13	.611	.069	2.99	3.27	1	5
Sustainable Planning	131	3.73	.656	.070	3.59	3.87	3	5
Adaptable Planning	12	4.25	.886	.313	3.51	4.99	3	5
Total	260	3.48	.727	.055	3.37	3.59	1	5

The overall SISP success rate in Australian organisations which 'attempt' some form of information systems planning is found to be 42.7% (Figure 6.3). The literature reports success rates mainly for large organisations that perform and implement SISP on a regular basis. Their success rates are significantly high, varying from 70% to 98% (Galliers, 1987, Groznik and Kovacic, 2000). To make this work comparable with these studies, the SISP success statistics for organisations that perform SISP on a regular basis is provided and shown graphically in Figure 6.5.

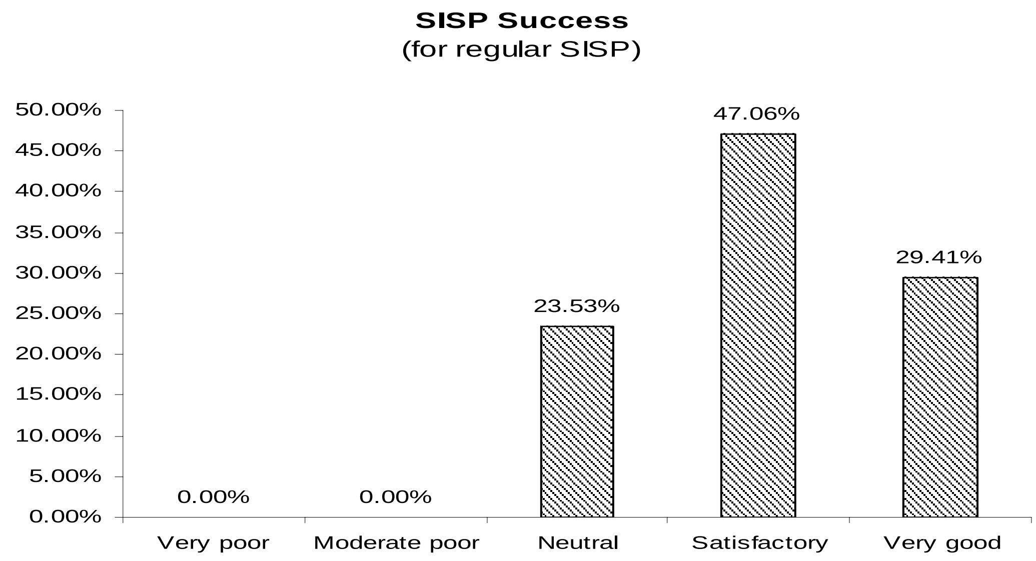


Figure 6.5 SISP Success in Australia: Organizations which Perform Regular SISP

In this case, an overall SISP success (expressed through the satisfaction of accomplishment of SISP objectives) is 76.47%. This percentage is comprised of 47.06% for ‘Satisfactory’ and 29.41% for the ‘Very Good’ scale. This result is comparable with the results reported in the SISP literature.

This study investigated the sustainability of SISP success (Figure 6.6). Performance of SISP is declining over a time instead of increasing. Full attention to SISP is given mainly at the beginning of the planning cycle. This is an indication that sustainability criteria are not integrated into SISP. Long term perspectives, wider participation and ownership as well as performance measures could ensure sustainable accomplishment of SISP objectives.

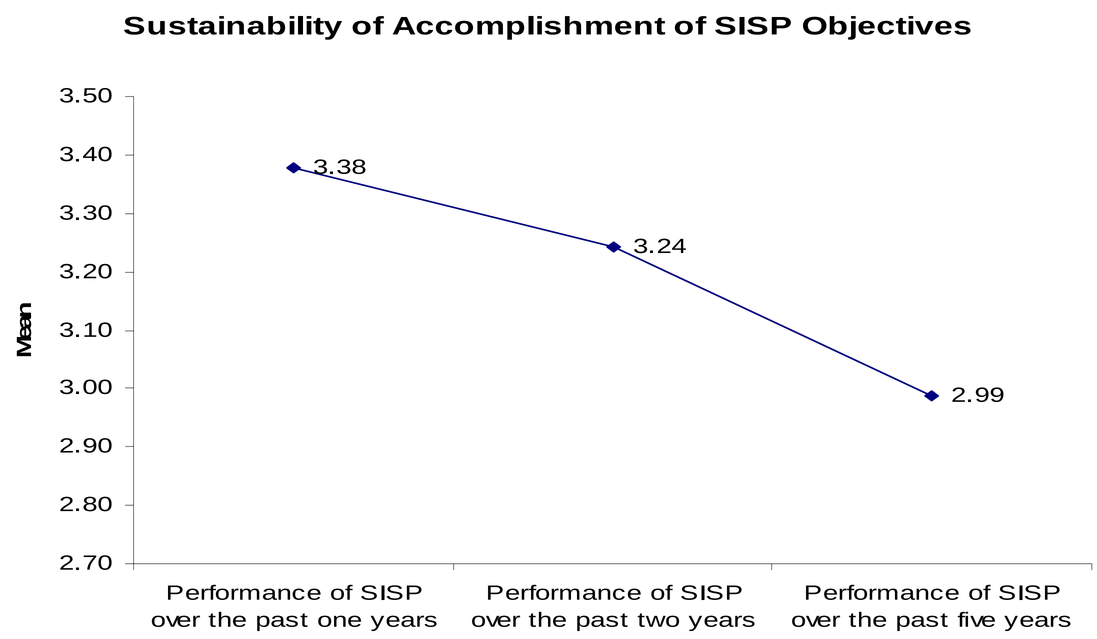


Figure 6.6 SISP Success Sustainability in Australia

Also, SISP success is assessed in regard to the size of a company (Table 6.28). This relationship is statistically significant at the 0.01 level and the mean values demonstrate that SISP success increases with a company’s size.

Table 6.28 SISP Success: Correlation with Company Size

	SISP Success		
Company size	Mean	Std. Deviation	Spearman's rho
Small	3.00	0.00	0.272*
Medium	3.41	0.71	
Large	3.71	0.76	

* Correlation is significant at the 0.01 level (2-tailed).

Table 6.29 lists, in a rank order by mean value, the SISP objectives. The mean values indicate that organisations do not have a single predominant SISP objective, or various organisations have different sets of SISP objectives. Still, the most distinct SISP objective is enabling existing business strategies, followed by improving customer satisfaction and enabling competitive advantage through superior capabilities. This rank revealed that Australian organisations do not consider the strategic relevance of IT as the key objective. The majority of them see IT as a business enabler, thus the strategic advantage associated with IT comes as a secondary objective.

Table 6.29 SISP Objectives: Correlation with SISP Maturity and Company Size

Rank	SISP Objectives	Mean	Std. Dev. .	SISP Maturity Level	Company Size
				Correlation (Spearman's rho	**Correlation** Spearman's rho
1	Enable existing business strategies	3.16	1.50	0.57*	0.28*
2	Improve customer satisfaction	3.08	1.51	0.43*	0.19**
3	Competitive advantage through superior capabilities	3.00	1.63	0.55*	0.26*
4	Create new business strategies	2.98	1.44	0.61*	0.16**
5	Provide advantage such as lower costs or product differentiation	2.95	1.54	0.44*	0.16**
6	Provide common database for decision making and planning	2.77	1.47	0.41*	0.13 NC
7	Improve IS team performance	2.75	1.36	0.43*	0.29*
8	Establish electronic links with suppliers or customers	2.72	1.42	0.47*	0.13 NC
9	The need to acquire the new technology	2.37	1.34	0.32*	0.10 NC
10	Coordination of IS functions with other resource functions	2.29	1.31	0.34*	0.12 NC
11	Make it more for our customers to change suppliers	1.71	1.10	0.41*	0.04 NC

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.

Table 6.29 also indicates the existence of a relationship between SISP objectives and SISP maturity levels. Correlation coefficients are provided at the item level to provide more insight into relationships. This relationship is supported in the SISP literature (Grover and Segars, 2005). However, a relationship between the SISP objectives and the size of an organisation is not discussed in the SISP literature. The SISP literature acknowledged that organisational size makes a difference in many aspects of SISP (Byrd et al., 1995; Teo et al., 1997; Groznik and Kovacic, 2000; Premkumar and King, 1994), thus Table 6.29 provides more insight into this relations. This study finds that there is a relationship between organisation size and SISP objectives but only for a set of objectives and not for individual objectives. The overall correlation (correlation between the SISP objectives factor and the company size) is positive and significant (Spearman's rho=0.167) at the 0.05 level (2-tailed).

Also, this study investigates the relationship between SISP objectives and IT structure and found that there is no relationships between them.

6.6.1 SISP Maturity versus Company Size

Previous sections demonstrated that larger companies perform SISP more regularly and that organisation size is a significant antecedent for SISP. This section investigates how SISP success and SISP maturity relate to a company size. It was shown in Chapter 2 that company size can be related to IT/IS maturity and quality of IT plans (Hagmann & McCahon, 1993; Byrd et al., 1995). The following hypothesis was defined in Chapter 2 and tested here.

H14	The larger the organisation, the greater the level of SISP maturity.

This hypothesis is tested by using two different variables representing the size of a company. One variable is the three-category (small, medium, large) dummy variable based on turnover, and the other one is the two-category (small+medium, large) dummy variable clustered on more criteria (number of employees, number of IS employees, total investment budget and available IT budget).

Results shown in Table 6.30 are based on a three-cluster organisation size variable. The Spearman's rho is 0.213 (greater than 0.15) and thus, the relationship is strong and significant at the 0.01 level. For the two-cluster organisation size variable, the Spearman's rho is 0.481, indicating an even stronger relationship. Consequently, the null hypothesis (there is no relationship) is rejected and the theory hypothesis supported. Also, Table 6.32 indicates rising SISP success with increase in organisational size and progress of SISP maturity. Percentages shown are not due to chance as the relationship is confirmed by bivariate correlation statistics (the Spearman's rho in Table 6.30 and Table 6.28). Searching the literature for evidence against this relationship, it was found that H14 is supported by Teo et al. (1997), and rejected by Groznik and Kovacic, (2000) and Premkumar and King (1994).

Table 6.30 Correlation: SISP Maturity and Organization Size

			SISP Maturity Level	**Company Size**
Spearman's rho	**SISP Maturity**	Correlation Coefficient	1.000	0.213*

			SISP Maturity Level	Company Size
	Level	Sig. (2-tailed)	.	0.002
	Company Size	Correlation Coefficient	0.213*	1.000
		Sig. (2-tailed)	0.002	.

* Correlation is significant at the 0.01 level (2-tailed).

A model for H14 is presented in Figure 6.7. Validity and reliability is confirmed as per procedures explained in chapter 3 and demonstrated in chapter 5.

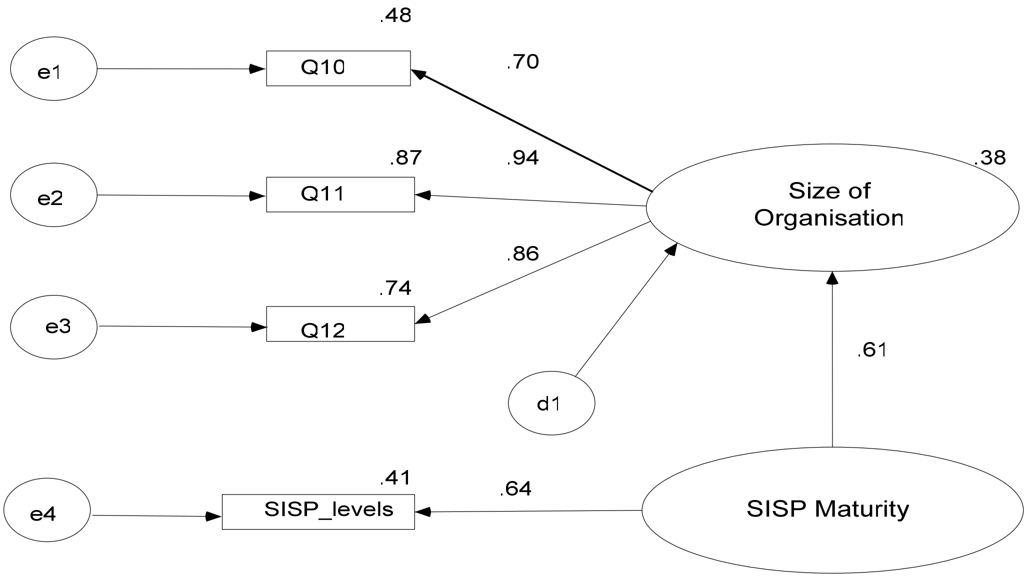


Figure 6.7 Model for SISP Maturity and Organisational Size: Measurement and Structural Model

The data fit this model and the fit statistics are shown in Table 6.31. The factor loadings confirmed strong relationships between SISP maturity and the organisational size. Correlation residuals and CR (critical ratio for regression weights) statistics are provided in Appendix G.

Table 6.31 SISP Maturity and Organisational Size Structural Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP Benefits	2.985	2	.225	1.49	0.027	0.991	0.957	0.990	0.053	0.997

Table 6.32 gives us much more understanding of what is happening in small organisations in regard to SISP maturity levels. 60% of small organisations are at the Attainable Planning level and 40% at the Sustainable Planning level. Small companies are 100% 'Neutral' when it comes to overall satisfaction with SISP. On the other hand, 35.7% of large companies are neither positive nor negative about the benefit of SISP but about 61% are satisfied with overall SISP performance. Medium sized companies are less satisfied, only 37% think positively about the accomplishment of SISP objectives.

Table 6.32 SISP Maturity and SISP Success: Relationship with Size of Company

Company size	SISP Success						Total
	SISP maturity level	Very poor	Moderately poor	Neutral	Satisfactory	Very Good	
Small	Attainable Planning			60.0%			60.0%
	Sustainable Planning			40.0%			40.0%
	Adaptable Planning						
	Total			100.0%			100.0%
Medium	Attainable Planning	1.9%		40.7%	5.6%	1.9%	50.0%
	Sustainable Planning			20.4%	22.2%	5.6%	48.1%
	Adaptable Planning				1.9%		1.9%
	Total	1.9%		61.1%	29.6%	7.4%	100.0%
Large	Attainable Planning		3.6%	17.9%	10.7%		32.1%
	Sustainable Planning			14.3%	35.7%	7.1%	57.1%
	Adaptable Planning			3.6%		7.1%	10.7%
	Total		3.6%	35.7%	46.4%	14.3%	100.0%

6.6.2 SISP Maturity and Benefits from SISP Relations

Improved internal communication and improved productivity are two main benefits resulting from the SISP endeavour in Australian organisations (Table 6.33). Communication is inherent to information technology, and deployment of IT/IS is traditionally seen as a way of improving productivity. Teo et al. (1997) found that benefits from SISP in Singapore are improved productivity and improved internal coordination, which is equivalent to the findings of this study. However, their third ranked position ‘Efficient and effective management of IS resources’ is ranked ninth in this study. The third benefit item in this study is ‘Enabled existing business strategies’ which indicates that the traditional perception of IT/IS benefits are changing toward a more significant role of IT/IS in the organisation. This fact and the number one ranked benefit of Adaptable planning, the decision support enhancement, confirm that trend. Knowing the levels of SISP maturity in Australian organisations, this result is expected. In other words, this result is another confirmation of the fit between the theoretically established SISP maturity levels and the empirical data. One more confirmation is the score low of the benefits of IT/IS for gaining competitive advantages. Gaining an advantage by means of strategic opportunities, according to the surveyed data is often not the case, proving the scope for better SISP utilisation in the Australian environment. This is an important finding of this study. It seems to be that SISP per se does not increase the strategic use of IT. Also, the need for better utilisation of SISP can be confirmed by comparing SISP objectives (Table 6.29) and SISP benefits (Table 6.33). Obviously, the highly positioned objectives are not met.

Chapter 2 defined the H1 hypothesis in regard to SISP benefits as:

H1	As SISP evolves towards higher maturity levels, the level of SISP benefits will increase.

Table 6.34 shows the data that support this hypothesis. This table shows a crosstabulation between SISP maturity and the percentage values for positive responses for the first five benefit items.

Table 6.33 Benefits of SISP: Descriptive Statistics

Rank by mean	Benefits of SISP	Mean	Std. Deviation
1	Improved internal communication	3.14	1.48
2	Improved productivity	3.08	1.46
3	Enabled existing business strategies	2.99	1.53
4	Provided better understanding of IT/IS potential	2.97	1.45
5	Quality of decisions support enhanced	2.95	1.51
6	Improved quality in products/services	2.90	1.54
7	Greater flexibility to meet changes external/internal environment	2.90	1.48
8	Greater ability to meet changes in the industry	2.89	1.41
9	Efficient and effective management of SISP resources	2.68	1.42
10	Enhanced competitiveness	2.64	1.47
11	Established electronic links with suppliers or customers	2.57	1.40
12	Helps with survival	2.34	1.30
13	Creates barriers to keep competitors from entering our markets	2.13	1.23

The mean values (95% confidence interval) for all responses show a monotonically increasing SISP benefits as SISP maturity increases. These relationships are significant at the 0.01 level and their strengths are confirmed by the significant value of the Spearman correlation coefficient. Thus, the null hypothesis cannot be accepted and the alternative hypothesis is supported.

Table 6.34 Benefits of SISP in regard to SISP Maturity Levels

Rank by mean			Attainable Planning (45%)	Sustainable Planning (50.4%)	Adaptable Planning (4.6%)	Spearman's Correlation rho
1	Improved internal communication	Agree Strongly Agree	38.46%*	68.18%*	100.00%*	0.41**
		Mean	**2.38**	**3.68**	**4.50**	
2	Improved productivity	Agree Strongly Agree	30.77%*	77.27%*	100.00%*	0.54**
		Mean	**2.15**	**3.77**	**4.5**	
3	Enabled existing business strategies	Agree Strongly	28.21%*	79.55%*	100.00%*	0.56**

Rank by mean			Attainable Planning (45%)	Sustainable Planning (50.4%)	Adaptable Planning (4.6%)	Spearman's Correlation rho
		Agree				
		Mean	**1.97**	**3.84**	**4.50**	
4	Provided better understanding of IT/IS potential	Agree Strongly Agree	28.21%*	68.18%*	75.00%*	0.49**
		Mean	**2,13**	**3.59**	**4.25**	
5	Quality of decisions support enhanced	Agree Strongly Agree	15.38%*	72.73%*	100.00%*	0.65**
		Mean	**1.87**	**3.75**	**4.75**	

* Relative Percentage (calculated as percentage of 100% for each planning level)
** Correlation is significant at the 0.01 level (2-tailed).

CFA and SEM are used to confirm the validity of the scale for the SISP benefit factor and also to confirm the existence of relationships between the SISP maturity levels and this factor. The Cronbach's alpha for the first five items shown in Table 6.34 is 0.946. CFA extracted one factor solution, indicating that all items bond together. Convergent validity is confirmed by the high standardised regression weights as it shown in Figure 6.8. The data fit this model and the fit statistics are shown in Table 6.35.

Table 6.35 SISP Maturity/Benefits Structural Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	PCFI
SISP Maturity/Benefits	16.046	8	0.042	2.00	0.028	0.969	0.920	0.982	0.070	0.53

The factor loadings confirm strong relationships between the SISP benefits factor and SISP maturity. All correlation residuals are less than 0.10 and these statistics along with fit indexes, provide the evidence for the fit for the model. Correlation residuals and CR for regression weights statistics are provided in Appendix G.

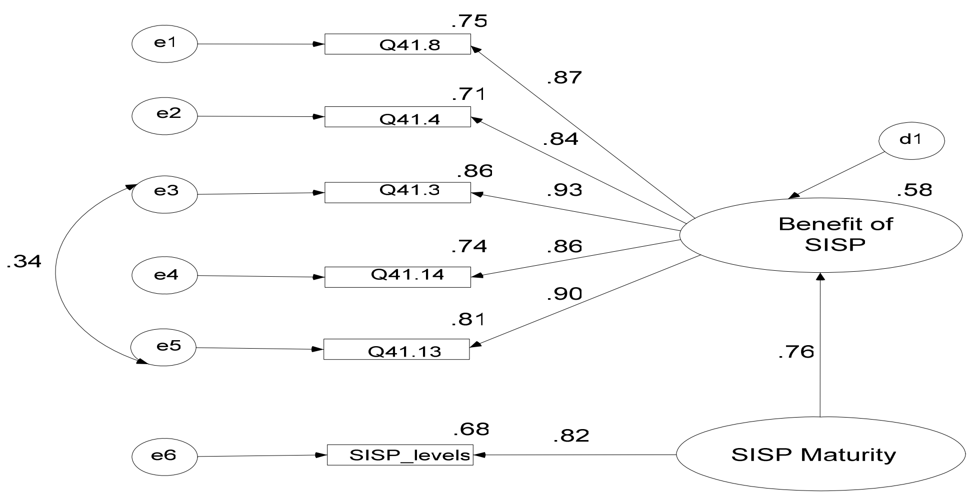


Figure 6.8 SISP Benefits: Measurement and Structural Model

6.7 The Key Issues in IT Management

According to the survey data, Table 6.36 summarises the key issues that IS management face in Australia. Rank is organised by total means.

Table 6.36 Key Issues in IT Management for SISP Maturity Levels in Australia

Rank	Key Issues	Attainable Planning (45%)	Sustainable Planning (50.4%)	Adaptable Planning (4.6%)	Total	Correlation
		Mean	Mean	Mean	Mean	Spearman rho
1	Aligning IT strategy with business strategy	3.54	4.34	5.00	4.01	0.47*
2	Meeting business and user needs	3.46	4.07	4.00	3.79	0.38*
3	Security issues	3.21	3.64	4.25	3.47	0.29*
4	Gaining top management commitment	3.18	3.68	2.50	3.40	0.17**
5	Maintaining service continuity	3.23	3.48	3.50	3.37	0.19*
6	Infrastructure management	2.97	3.52	4.00	3.30	0.34*
7	Measuring IT's values	3.03	3.45	4.00	3.29	0.32*
8	Coping with external environmental change	2.97	3.55	3.00	3.26	0.29*
9	Feasibility of strategy implementation	3.05	3.36	3.75	3.24	0.23*
10	Excessive spending on IS/IT***	3.15	3.18	3.75	3.20	0.08NC
11	Coping with internal environmental change***	2.95	3.39	2.50	3.15	0.15NC
12	Dealing with senior management***	3.10	3.14	2.75	3.10	-0.02NC
13	Recruiting and retaining staff***	3.00	3.05	3.00	3.02	0.03NC
14	Keeping up with technology***	3.00	2.89	2.75	2.93	-0.09NC
15	Outsourcing of IS/IT***	2.46	2.27	1.75	2.33	-0.15NC

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.
*** Item dropped

Despite geographical remoteness, today's globalization puts Australia on the same SISP bandwagon. Alignment as a world's number one SISP issue (Table 2.2) is a number one concern for Australian IT executives, too. This clarifies that the very recently promoted trends that SISP should be beyond alignment and competitive advantage (Grover & Segars, 2005, Ward & Peppard, 2002) are far from rooting in the Australian environment, based on survey data from 2003. This statement is based on the fact that only 4.6% of organizations reached the highest level of SISP maturity.

A correlations test is performed (Table 6.36) to assess the validity of the key issues in IT management for various SISP maturity levels. It can be seen from Table 6.36 that alignment, 'meeting business and user needs' and security issues are the top concerns across all maturity stages. Gaining top management commitment in Adaptable planning is of less importance in comparison with other SISP maturity stages. This is expected as at that maturity level, the importance of SISP should be well communicated and responsibilities should be well defined and followed.

According to Table 2.2 one of the top world wide key IT issues is resources. Table 6.36 shows that it is not currently the case in Australia. This is to be expected in the post dot-com boom situation. Outsourcing of IS/IT and coping with internal environmental change shows significant but weak relationships. Also, it is noticeable that issues related to technology (like creating an information architecture and providing a budget for that) are not the main concerns of IT managers in Australia. This can be explained by the fact that firms have established IT infrastructure, which may require upgrades for which is not hard to justify and obtain budgets.

The results of this study are compared with the results of Palvia and Palvia (2003). The authors reported Pervan's findings for key issues in IS management in Australia in 1993, i.e. a decade ago. At that time, the issue of 'Aligning the IS organisation with that of the enterprise' was ranked third. A decade ago, 'Improving IS strategic planning' was the number one issue and certainly the security issue was not a big concern. Nowadays, electronic integration and e-business are vulnerable for misuse of information. Proper protection (installation of fire walls, data encryption etc.) for many business is of prime importance. Thus, the third ranked position of security is not a surprise, rather it is an indication that SISP issues are different in different time frames. Consequently, the continuous scanning of SISP practices to discover emerging issues is important.

6.7.1 Key Reasons for SISP Formulation Failure in Australia

It is of significant value to explore the key reasons for SISP formulation failures in Australian organizations. According to Table 2.10, the number one ranked reason for SISP formulation failure is misalignment with business objectives. This study found it to be on the fifth position. This may sound unexpected but on the contrary, this finding perfectly matches the following reasoning. If the common rationale for failures is known and widely publicized, SISP actors will focus their activities to avoid those barriers, which will lead to the reduction of SISP failure. This also implies that the 'SISP community' is an evolving environment, which learns from the past. Table 6.36 shows that alignment of IT and business strategies is a number one priority of IS management and normally one would expect that it would less likely become the reason for failure, at least in the plan formulation phases. This demonstrates and confirms the usefulness of the empirical assessment of the key reasons for SISP failures.

As is shown in Table 6.37, the main reason for the SISP formulation failure is the lack of commitment from senior management and the third and fourth positions are the 'lack of senior management involvement' and 'IS management is not part of the corporate planning process' respectively. This is very much in line with the recent SISP literature and also matches the ratings in Table 2.10. Budget limitation, as the second key reason for SISP formulation failure, is somewhat unexpected.

Table 6.37 SISP Formulation Failure in regard to the SISP Maturity Levels

Rank by Means	**Key Reason for SISP Formulation Failure**	**Mean**	**Attainable Planning** (45%)	**Sustainable Planning** (50.4%)	**Adaptable Planning** (4.6%)	**Spearman Correlation (rho)**
1	Lack of commitment from senior management	1.99	20.51%***	45.45%***	0.00%	0.17*
2	Budget limitations	1.87	23.08%***	50.00%***	0.00%	0.18*
3	Lack of senior management involvement	1.85	17.95%***	40.91%***	0.00%	0.17*
4	IS management is not part of the corporate planning process	1.76	12.82%***	38.64%***	0.00%	0.20**
5	Lack of alignment with business objectives	1.70	15.38%***	40.91%***	0.00%	0.19*
6	Inadequate framework used for setting IT investment priorities	1.69	20.51%***	43.18%***	0.00%	0.16*
7	Inappropriate planning horizons	1.66	15.38%***	43.18%***	0.00%	0.20*
8	No learning from past experience	1.63	12.82%***	45.45%***	0.00%	0.27*
9	No adequate knowledge and expertise	1.61	12.82%***	38.64%***	0.00%	0.22**
10	No motivation for the initialisation of SISP reviews	1.60	12.82%***	40.91%***	0.00%	0.20**
11	Intangible benefits are not presented to the sponsor	1.60	12.82%***	38.64%***	0.00%	0.21*
12	No review process	1.59	12.82%***	38.64%***	0.00%	0.20**
13	Inadequate methodology used	1.57	15.38%***	38.64%***	0.00%	0.17*
14	Requires too much top management involvement	1.57	12.82%***	40.91%***	0.00%	0.22**
15	Failure to consider the external business environment	1.56	10.26%***	40.91%***	0.00%	0.28**
16	Not fully investigated risk	1.56	10.26%***	39.53%***	0.00%	0.24**
17	Planning exercise takes very long	1.52	7.69%***	36.36%***	0.00%	0.26**
18	Technology lagging behind needs	1.52	10.26%***	38.64%***	0.00%	0.27**
19	Inappropriate measures or too much measurement	1.47	7.69%***	38.64%***	0.00%	0.28**
20	Unrealistic competitive advantage, mistaken	1.45	10.26%***	40.91%***	0.00%	0.27*

Rank by Means	Key Reason for SISP Formulation Failure	Mean	Attainable Planning (45%)	Sustainable Planning (50.4%)	Adaptable Planning (4.6%)	Spearman Correlation (rho)
	impressions					
21	Planning exercise is too expensive	1.37	10.26%***	31.82%***	0.00%	0.19*

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
*** Relative Percentage (calculated as a percentage is out of 100% for each planning level)
Note: Percentage is calculated for positive responses (some importance to crucial)

Also, the previously third-ranked ‘problem with resources’ now occupies a much lower position; it is now at the ninth position. A possible explanation is that the normal SISP evolution process added to the knowledge and experience of those involved and the popularity of IT attracted many students over last decades. These are now manifesting in terms of higher availability of IT resources. These factors elevated the problem, but the lack of adequate expertise is still considered as one of the ten most important reasons for SISP formulation failure.

The seventh-ranked ‘inappropriate planning horizons’ reason is highly regarded, it reflects the importance of the planning time dimension. The traditional long-term planning could be inappropriate for dynamic environments, or planning at different time scales may be required.

Surprisingly the ‘unrealistic competitive advantage, mistaken impressions’ item scored a very different ranking. In the past, the fourth position of this item implied that strategic IS plans suffered of promoting ‘unrealistic expectations’. Creating false expectations and promising strategic competitive advantage for every IT investment certainly, in general, caused companies to invest too much and receive too little in return. It seems that the lesson from the past has been learned as this is now the least important reason for SISP failure. SISP is no longer based on over expectations or hype, and is now customer rather than vendor driven.

Table 6.37 showed that the Adaptable Planning level is not associated with the SISP formulation failures, thus those organisations did not judge the importance of the reasons for SISP failure. This is not due to chance as this relationship is strong and significant at the 0.05 level. Organisations at Sustainable Planning levels take the importance of SISP formulation failures more seriously than organisations at the Attainable Planning levels. Higher values in the Sustainable Planning column should not be interpreted that this level of maturity has higher failure rates. On the contrary, the success rate at this level is higher (Table 6.26) as organisations consider the reasons for failures with more attention. Organisations at level 3 do not appropriately evaluate the SISP formulation phase and they are even 'not aware' of problems they had at that stage of SISP planning.

Table 6.38 Key Reasons for the SISP Formulation Failure in regard to Company Size

Rank by Means	**Key Reason for SISP Formulation Failure**	**Mean**	**Small** (<10 M) 5.7%	**Medium** (10 to 500)M 62.1%	**Large** (>500M) 32.2%	**Spearman Correlation (rho)**
1	Lack of commitment from senior management	1.99	40.00%*	29.63%*	35.71%*	0.03 NC
2	Budget limitations	1.87	60.00%*	29.63%*	42.86%*	0.00 NC
3	Lack of senior management involvement	1.85	40.00%*	25.93%*	32.14%*	0.02 NC
4	IS management is not part of the corporate planning process	1.76	40.00%*	20.37%*	32.14%*	0.08 NC
5	Lack of alignment with business objectives	1.70	40.00%*	24.07%*	32.14%*	0.04 NC
6	Inadequate framework used for setting IT investment priorities	1.69	40.00%*	25.93%*	39.29%*	0.09 NC
7	Inappropriate planning horizons	1.66	40.00%*	27.78%*	28.57%*	-0.02 NC
8	No learning from past experience	1.63	40.00%*	27.78%*	28.57%*	0.00 NC
9	No adequate knowledge and expertise	1.61	40.00%*	20.37%*	32.14%*	0.08 NC
10	No motivation for the initialisation of SISP reviews	1.60	40.00%*	22.22%*	28.57%*	0.00 NC
11	Intangible benefits are not presented to the sponsor	1.60	40.00%*	24.07%*	28.57%*	0.01 NC
12	No review process	1.59	40.00%*	24.07%*	25.00%*	-0.03 NC
13	Inadequate methodology used	1.57	40.00%*	24.07%*	28.57%*	-0.01 NC
14	Requires too much top management involvement	1.57	40.00%*	24.07%*	28.57%*	-0.01 NC
15	Failure to consider the external business environment	1.56	40.00%*	22.22%*	28.57%*	0.03 NC
16	Not fully investigated risk	1.56	40.00%*	22.64%*	25.00%*	-0.03 NC
17	The planning exercise takes very long	1.52	40.00%*	22.22%*	25.00%*	-0.01 NC
18	Technology lagging behind needs	1.52	40.00%*	22.22%*	17.86%*	-0.10 NC
19	Inappropriate measures or too much measurement	1.47	40.00%*	22.22%*	21.43%*	-0.06 NC
20	Unrealistic competitive advantage, mistaken impressions	1.45	40.00%*	22.22%*	28.57%*	0.03 NC
21	Planning exercise is too expensive	1.37	40.00%*	18.52%*	21.43%*	-0.05 NC

* Relative Percentage (calculated as a percentage is out of 100% for each company size)
Note: Percentage is calculated for positive responses (some importance to crucial)
NC Correlation is not statistically significant.

In Table 6.38 the Spearman coefficient rho, demonstrates that there are no relationships between the cause of SISP formulation failure and the size of an organization (rho <0.15, p>0.05). This is a significant confirmation. SISP failures occur in any size organization. This finding reinforces the result of Flynn and Goleniewska (1993) study.

6.7.2 Key Reasons for the SISP Implementation Failure in Australia

The key reasons for the failure of SISP implementations in Australian organizations are shown in Table 6.39. The rank position was calculated by ordering the mean values obtained as responses to the survey questionnaire in regard to the importance of the reason for SISP implementation failure. It can be seen, that the reasons for the SISP implementation and formulation do not differ significantly. The commitment and involvement of management play a key role. Budget limitations and the lack of alignment have exchanged their positions, which was not the expectation. The lack of knowledge and expertise is more evident in this phase.

Table 6.39 SISP Implementation Failure in regard to the SISP Maturity Levels

Rank by Means	**Key Reason for SISP Implementation Failure**	**Mean**	**Attainable Planning** (45%)	**Sustainable Planning** (50.4%)	**Adaptable Planning** (4.6%)	**Spearman Correlation (rho)**
1	Lack of commitment from senior management	1.78	10.53%***	40.91%***	0.00%	0.256**
2	Lack of alignment with business objectives	1.67	7.89%***	38.64%***	0.00%	0.258**
3	IS management is not part of the corporate planning process	1.66	7.89%***	34.09%***	0.00%	0.232**
4	Lack of senior management involvement	1.64	7.89%***	38.64%***	0.00%	0.276**
5	Budget limitations	1.63	10.53%***	38.64%***	0.00%	0.237**
6	No adequate knowledge and expertise	1.62	7.89%***	38.64%***	0.00%	0.263**
7	Inadequate framework used for setting IT investment priorities	1.60	7.89%***	36.36%***	0.00%	0.254**
8	No motivation for the initialisation of SISP reviews	1.60	7.89%***	36.36%***	0.00%	0.253**
9	Inappropriate planning horizons	1.55	5.26%***	38.64%***	0.00%	0.298**
10	Failure to consider the external business environment	1.53	7.89%***	34.09%***	0.00%	0.235**
11	Rapid change of technology	1.52	7.89%***	36.36%***	0.00%	0.247**
12	Intangible benefits are not presented to the sponsor	1.52	7.89%***	37.21%***	0.00%	0.248*
13	No learning from past experience	1.51	10.53%***	37.21%***	0.00%	0.217*
14	Cultural Gap	1.50	7.89%***	36.36%***	0.00%	0.253**
15	Not fully investigated risk	1.49	10.53%***	36.36%***	0.00%	0.221**
16	Inadequate methodology	1.48	10.53%***	31.82%***	0.00%	0.173*

Rank by Means	Key Reason for SISP Implementation Failure	Mean	Attainable Planning (45%)	Sustainable Planning (50.4%)	Adaptable Planning (4.6%)	Spearman Correlation (rho)
	used					
17	No review process	1.47	5.26%***	32.56%***	0.00%	0.251*
18	Requires too much top management involvement	1.41	5.26%***	31.82%***	0.00%	0.249**
19	Unrealistic competitive advantage, mistaken impressions	1.33	5.26%***	27.27%***	0.00%	0.212**

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
*** Relative Percentage (calculated as a percentage is out of 100% for each planning level)
Note: Percentage is calculated for positive responses (some importance to crucial)

An inappropriate planning time dimension is still one of the ten reasons for SISP implementation failure. The failure to consider the external business environment climbed from the fifteenth position to the tenth position. It is noticeable that the mean values for the SISP implementation failures are less than those for SISP formulation failures. This is to be expected, as the plan implementation depends on the quality of the preparation of the plan. If SISP planning is conducted appropriately, the chances of implementation failure are greatly reduced.

Table 6.40 Key Reasons for SISP Formulation Failure in regard to Company Size

Rank by Means	Key Reason for SISP Formulation Failure	Mean	Small (<$10 M) 5.7%	Medium ($10 to $500)M 62.1%	Large (>$500M) 32.2%	Spearman Correlation (rho)
1	Lack of commitment from senior management	1.99	40.00%*	29.63%*	35.71%*	0.03 NC
2	Budget limitations	1.87	60.00%*	29.63%*	42.86%*	0.00 NC
3	Lack of senior management involvement	1.85	40.00%*	25.93%*	32.14%*	0.02 NC
4	IS management is not part of the corporate planning process	1.76	40.00%*	20.37%*	32.14%*	0.08 NC
5	Lack of alignment with business objectives	1.70	40.00%*	24.07%*	32.14%*	0.04 NC
6	Inadequate framework used for setting IT investment priorities	1.69	40.00%*	25.93%*	39.29%*	0.09 NC
7	Inappropriate planning horizons	1.66	40.00%*	27.78%*	28.57%*	-0.02 NC
8	No learning from past experience	1.63	40.00%*	27.78%*	28.57%*	0.00 NC
9	No adequate knowledge and expertise	1.61	40.00%*	20.37%*	32.14%*	0.08 NC
10	No motivation for the initialisation of SISP reviews	1.60	40.00%*	22.22%*	28.57%*	0.00 NC
11	Intangible benefits	1.60	40.00%*	24.07%*	28.57%*	0.01 NC

Rank by Means	Key Reason for SISP Formulation Failure	Mean	Small (<$10 M) 5.7%	Medium ($10 to $500)M 62.1%	Large (>$500M) 32.2%	Spearman Correlation (rho)
	are not presented to the sponsor					
12	No review process	1.59	40.00%*	24.07%*	25.00%*	-0.03 NC
13	Inadequate methodology used	1.57	40.00%*	24.07%*	28.57%*	-0.01 NC
14	Requires too much top management involvement	1.57	40.00%*	24.07%*	28.57%*	-0.01 NC
15	Failure to consider the external business environment	1.56	40.00%*	22.22%*	28.57%*	0.03 NC
16	Not fully investigated risk	1.56	40.00%*	22.64%*	25.00%*	-0.03 NC
17	Unrealistic competitive advantage, mistaken impressions	1.45	40.00%*	22.22%*	28.57%*	0.03 NC

* Relative Percentage calculated as a percentage is out of 100% for each company size).
NC Correlation is not statistically significant.
Note: Percentage is calculated for positive responses (some importance to crucial)

Table 6.40 indicates the lack of a significant relationship between SISP formulation failure and organizational size. This may be explained by the fact that only a small number of organizations are on the Adaptable level and SISP failures are present in any size of organization.

6.8 Assessment of SISP System Behaviour and Structure

6.8.1 Effectiveness

This section closely investigates the effect of the effectiveness of SISP on overall SISP success. SISP effectiveness is assessed through its subdimensions: Collaboration, Form & Content, Policies and Knowledge Bank defined in Chapters 2 and 4. The assessment of these subdimensions is conducted in the context of organisational size and levels of SISP maturity.

6.8.1.1 Collaboration

Collaboration is defined in general terms as a joint intellectual effort, communication or coordination. In this research, it is mainly represented by the ‘Alignment’ between content of the two plans (the business and the information technology plans) and ‘Communication’ which brings the quality to SISP and ensures the support and success of SISP. The following section discusses the results of the survey related to these two attributes of Collaboration. At the end of the section, the CFA is presented to demonstrate the existence of these latent factors and to confirm the structural model of the Collaboration construct.

6.8.1.1.1 Strategic Alignment

Alignment between SISP and Business planing is ranked as the No. 1 issue prompting to closer analyse alignment in Australian organisations. As misalignment between business and IS planning is persistently reported as a number one issue, this study reports the strengths of the link between the two and the form of the alignment.

The summarised results of Table 6.41 indicates that confirmatory answers (agree and strongly agree) for integrated links are the highest at 46% and that partnership links are at about 38%, weak links are at 17% and no link at all is 1%. When these results are assessed in the context of company size, it is found that small companies which perform SISP did not report weak links and medium sized companies have at least twice more weak links than large companies. When it comes to partnership relations, large companies have at least double percentage of partnership links in comparison with medium size companies and one and a half more than what was reported for small companies.

Table 6.41 Strengths of Linkage between SISP and Business Planning versus Company Size

		Small (<$10 M) 5.7%	**Medium** ($10 to $500)M 62.1%	**Large** (>$500M) 32.2%	**Total**	**Spearman Correlation rho**
Partners	Strongly Disagree	1.1%	13.8%	3.4%	18.4%	0.208**
	Disagree		6.9%	2.3%	9.2%	
	Neither Agree or Disagree	2.3%	24.1%	8.0%	34.5%	
	Agree	1.1%	12.6%	13.8%	27.6%	
	Strongly Agree	1.1%	4.6%	4.6%	10.3%	
Integrated	Strongly Disagree		10.3%		10.3%	0.215**
	Disagree		5.7%	3.4%	9.2%	
	Neither Agree or Disagree	2.3%	24.1%	8.0%	34.5%	
	Agree	3.4%	17.2%	16.1%	36.8%	
	Strongly Agree		4.6%	4.6%	9.2%	
Weak link	Strongly Disagree	3.4%	29.9%	26.4%	59.8%	-0.244**
	Disagree		1.1%		1.1%	
	Neither Agree or Disagree	2.3%	17.2%	2.3%	21.8%	
	Agree		10.3%	2.3%	12.6%	
	Strongly Agree		3.4%	1.1%	4.6%	
No link	Strongly Disagree	3.4%	43.7%	31.0%	78.2%	-0.306**
	Disagree					
	Neither Agree or Disagree	2.3%	17.2%	1.1%	20.7%	
	Agree					
	Strongly Agree		1.1%		1.1%	

** Correlation is significant at the 0.01 level (2-tailed).

All relations are significant and strong at the 0.01 level. Similar results are obtained when the linkage is observed in relations to the stages of SISP maturity. The minus ('–') sign of the Spearman rho indicates the opposite direction for 'weak link' and 'no link' relations.

For comparative purposes, the results of Galliers (1987), Teo et al. (1997), Groznik & Kovacic (2000) studies are shown in Table 6.42.

Table 6.42 Comparable Analysis of Strength between Business Planning and SISP Planning

	Strategic IS Planning Alignment	**Australia* (1985)**	**UK* (1985)**	**Singapore (1996)**	**Slovenia (1998)**	**This Study (Australia) (2003)**
Form of Connection	SISP is performed in response to business planning	27.9%	27.4%	79.3% [a]	92.4% [b]	36.8%**
	SISP is part of business planning	34.4%	40.7%			42.5%***
	SISP is a basis for business planning	4.9%	1.8%			39.1%****
	SISP is performed in isolation from business planning	32.8%	30.1%			11.6%
Strength of Connection	Inextricably tied	8%	8%	c	d	37.9%
	Somewhat linked	48%	34%			46%
	Tenuously linked	35%	42%			17.2%
	Totally isolated	8%	15%			1.1%

* Galliers, 1987
** Mapped to 'The business plan refers to the IS plan'
*** Mapped to 'The business plan refers to value creation potential of information'
**** Mapped to 'The business plan contains reasonable expectations of IS'
(a) Teo et al. (1997), based on 46 sample
(b) Groznik & Kovacic (2000), based on 61 sample
(c) (d) data not available

Table 6.42 shows alignment between business and SISP planning. A comparison with Gallier's results reveals that since the late 80s, this form of alignment has increased significantly in Australia. On the other hand, the comparative results from the other two studies are worrying, especially since they were conducted five to seven years earlier. The opposite direction, alignment between SISP and business planning was confirmed in an average of 54.6% cases. The highest percentage (71.2%) was scored for 'The IS Plan supports the business strategies' item.

Statistic analysis showed a strong positive correlation, significant at the 0.01 level between SISP and business alignment in both directions. Correlation between SISP and business planning was stronger (rho=0.43) than in the opposite direction (rho=0.29).

Table 6.43 and Table 6.44 address the hypothesis defined in Chapter 2 as:

H4	As the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases.

Table 6.43 demonstrates strong correlations between SISP maturity levels and the alignment between IS and business planning. The Spearman rho is positive and above the cut-off point, and significant at the 0.01 level. Also, the monotonically increasing values of the positive responses, shown in brackets (as relative values of 100%) clearly demonstrate that alignment increases with SISP maturity progress.

Table 6.43 SISP and Business Planning Alignment in regard to SISP Maturity Levels

Form of Alignment	**Attainable Planning** (45%)	**Sustainable Planning** (50.4%)	**Adaptable Planning** (4.6%)	**Spearman Correlation** (rho)
The IS plan reflects the business plan mission	13.79% **(30.64%)***	39.08% **(77.54)***	4.60% **(100.00)***	0.53**
The IS plan reflects the business plan goals	16.09% **(35.76)***	44.83% **(88.95)***	4.60% **(100%)***	0.59**
The IS Plan supports the business strategies	19.54% **(43.42)***	47.13% **(93.51)***	4.60% **(100%)***	0.59**
IS Plan selects a portfolio that maximizes total business value	4.60% **(28.59)***	31.03% **(69.22)***	4.60% **(100%)***	0.59**
The IS plan recognizes external business environment forces	5.75% **(12.78)***	34.48% **(68.41)***	4.60% **(100%)***	0.62**
The IS plan reflects the business plan resource constraints	10.34% **(22.98)***	33.33% **(66.13)***	4.60% **(100%)***	0.43**
The business plan refers to the IS plan	6.90% **(15.33)***	26.44% **(52.46)***	3.45% **(100%)***	0.42**
The business plan refers to value creation potential of information	9.20% **(20.44)***	28.74% **(57.02)***	4.60% **(100%)***	0.33**
The business plan contains reasonable expectations of IS	2.30% **(5.11)***	32.18% **(63.85)***	4.60% **(100%)***	0.59**

* Relative Percentage (calculated as a percentage is out of 100% for each planning level)
** Correlation is significant at the 0.01 level (1-tailed)
Note: Percentage is calculated for positive responses (agree and strongly agree)

Table 6.44 presents the response crosstabulation between the SISP maturity levels and the linkage of IS planning and business planning. It can be seen that adaptable planning has only 'strongly disagree' responses with association to 'no link' or 'weak link' responses. The calculated means have ascending values as the SISP maturity level increases for 'integrated' and 'partner' links and descending values for 'weak link' and 'no link' responses. To confirm that this is not due to chance, bivariate correlation is performed. The values of Spearman rho confirms that this correlation is strong and not due to chance at the 0.01 level of significance. Consequently, H3 cannot be rejected.

Table 6.44 Linkage between SISP and Business Planning in regard to the SISP Maturity Levels

	Form of Linkage	**Attainable Planning** (45%)	**Sustainable Planning** (50.4%)	**Adaptable Planning** (4.6%)	**Spearman Correlation** (rho)

	Form of Linkage	**Attainable Planning** (45%)	**Sustainable Planning** (50.4%)	**Adaptable Planning** (4.6%)	**Spearman Correlation** (rho)
Partners	Strongly Disagree	8.2%	9.2%	1.1%	0.268(**)
	Disagree	4.6%	4.6%		
	Neither Agree or Disagree	24.1%	9.3%	1.1%	
	Agree	8.0%	19.3%		
	Strongly Agree		8.0%	2.3%	
	Mean	**2.72**	**3.25**	**3.5**	
Integrated	Strongly Disagree	5.7%	4.6%	4.60%	0.443(**)
	Disagree	4.8%	4.6%	4.60%	
	Neither Agree or Disagree	26.4%	8.0%	4.60%	
	Agree	6.9%	27.4%	2.3%	
	Strongly Agree	1.1%	5.7%	2.3%	
	Mean	**2.85**	**3.5**	**4.5**	
Weak link	Strongly Disagree	14.9%	40.2%	4.60%	-.430(**)
	Disagree		1.1%		
	Neither Agree or Disagree	20.9%	1.1%		
	Agree	6.9%	5.7%		
	Strongly Agree	2.3%	2.3%		
	Mean	**2.59**	**1.59**	**1**	
No link	Strongly Disagree	23.0%	50.4%	4.6%	-.571(**)
	Disagree	20.9%			
	Neither Agree or Disagree	1.1%			
	Agree				
	Strongly Agree				
		2.01	2.03	1	

** Correlation is significant at the 0.01 level (2-tailed)

Frequency and correlation analysis revealed that organizations at the Adaptable Planning level have IS and business plans completely aligned (in both directions). Attainable Planning achieved this alignment at only 23.9%, while Sustainable maturity level is at 70.8% as an average. Progress in the strength of the link between SISP planning and business planning is evident. At the Adaptable Planning level, integrated linkage is achieved at 100% and partnership relations are at the 50% level.

SAM and CFA are used to confirm the subdimensions of the alignment. The standard procedure for validating the measurement model and fitting the structural model is followed. The model presented in Figure 6.9 shows the three factors of the alignment: SISP content alignment with business plan, business plan content alignment with SISP, and strengths (linkage) of the alignment. As the data did not fit the model, this model is respecified to include the error covariance between e2&e3, and e7&e10 as suggested by the modification indexes to improve the model. There is substantive support from theory to justify this improvement, but despite that, the model fit was inadequate ($\chi 2 = 86.696(38)$, $\chi^2/DF=2.28$, RMSEA=0.86, indicating the poor model). The final model did not include the Strengths of Alignment. This means that the strength (quality) of alignment is statistically significant on its own but within the model it competes with another path where it becomes insignificant. It is possible that this is due to scale overlap with other alignment scales, as the strength of alignment on its own is a (weaker) substitution for other scales. This trimming is reflected in Figure 6.10, which explores the relationship (structural path) between alignment and SISP maturity.

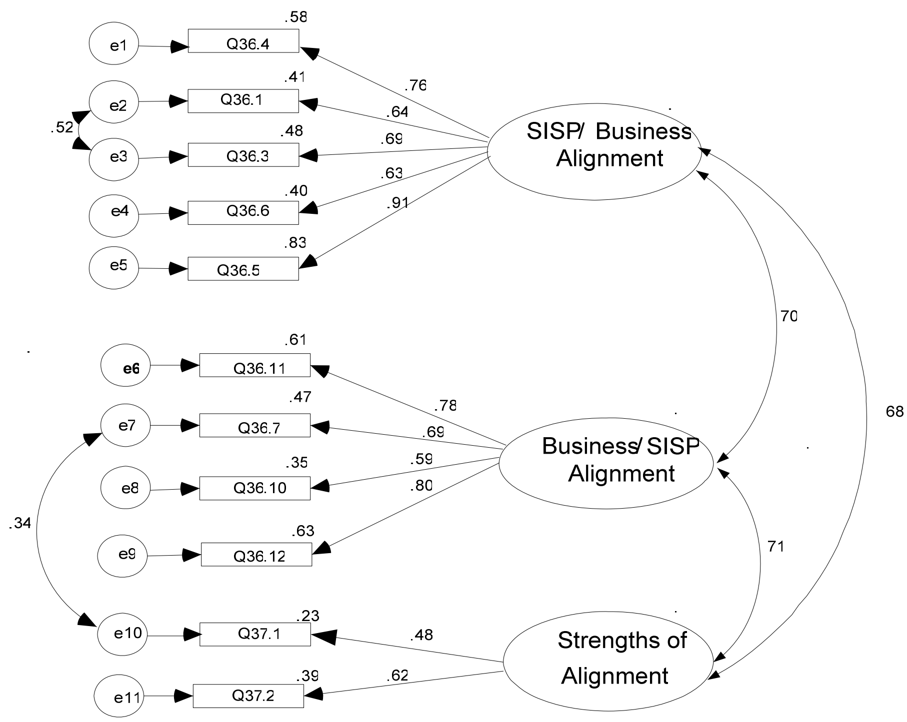


Figure 6.9 Original SISP Alignment Measurement Model

The fit statistic shown in Table 6.45 is adequate. The regression weight (significant at the 0.01 level) confirmed strong relationships between alignment and SISP maturity. All other statistics confirmed the validity of the SISP alignment factors for use in further statistical analysis. These statistics are shown in Appendix G.

Table 6.45 SISP Alignment Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP - Alignment	61.4	32	0.01	1.91	0.040	0.935	0.89	0.938	0.073	0.97

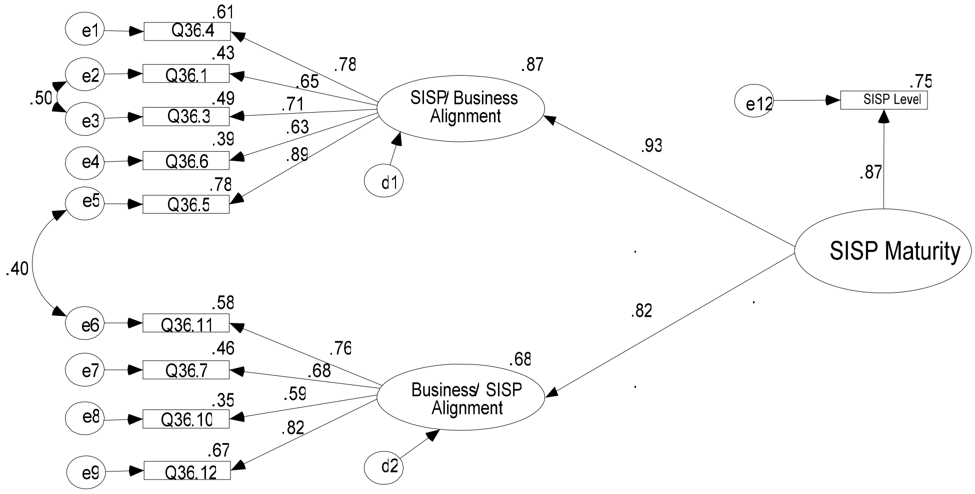


Figure 6.10 Final SISP Alignment: Measurement and Structural Model

6.8.1.1.2 Communication and Coordination

Meeting business and user needs is ranked as a number two key issue in IT Management in Australia (Table 6.36). To adequately identify and prioritise business and user needs, good communication of SISP information and coordination of various processes are required. The process of good communication establishes good relationships (Collins and McLaughlin, 1998). Not having good communication is seen as a major problem (61.1% rate) in launching IS planning effort (Teo and Ang, 2001). Very often, the support needed from managerial structure is not gained as the potential of IT/IS is not adequately communicated. This is indicated by the high score of ‘intangible benefits are not presented to the sponsor’ in Table 6.37 which presents the key reason of SISP failure in Australia. Table 6.46 shows items which measure communication attributes of the Collaboration construct.

Table 6.46 Assessment of SISP Communication Issues in regard to the SISP Maturity Levels

	SISP maturity level	Mean	Spearman's rho
IS/IT function is seen as value-adding to the business	Attainable Planning	0.26	0.21**
	Sustainable Planning	0.45	
	Adaptable Planning	0.50	
IS/IT function is perceived as business enabler	Attainable Planning	0.44	0.18*
	Sustainable Planning	0.59	
	Adaptable Planning	0.75	
IS/IT function is perceived as business driver	Attainable Planning	0.10	0.25**
	Sustainable Planning	0.27	
	Adaptable Planning	0.50	
Extent of establishing electronic links with suppliers or customers	Attainable Planning	1.97	0.47**
	Sustainable Planning	3.32	
	Adaptable Planning	3.50	
Providing common database for	Attainable Planning	2.10	0.41**

	SISP maturity level	Mean	Spearman's rho
decision making and planning	Sustainable Planning	3.30	
	Adaptable Planning	3.50	
Coordination of IS functions with other resource functions	Attainable Planning	1.77	0.34**
	Sustainable Planning	2.75	
	Adaptable Planning	2.25	
Business and IS planning calendars are synchronized***	Attainable Planning	2.59	0.48**
	Sustainable Planning	3.43	
	Adaptable Planning	4.50	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
*** Item dropped (single item factor).

Also this table shows that the mean values for Adaptable planning are the highest and for Attainable planning the lowest. Adaptable planning scored the highest values for the item 'Business and IS planning calendars are synchronized' which is strong reflection of 'Collaboration' in mature stage of SISP. These values are not due to chance. The nonparametric correlation showed that the values in Table 6.46 were strong and significant at the 0.05 or 0.01 levels.

The previous sections discussed these items in the light of organisational size (Table 6.16) and as a perception of SISP participants (Table 6.18).

The fit statistic for two latent factors is shown in Table 6.47 and the factor loadings are shown in Figure 6.11. All statistics confirmed the validity of the factors for use in further statistical analysis.

Table 6.47 Communication and Coordination Latent Factors: Measurement Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Communication & Coordination	14.8	8	0.062	1.85	0.035	0.97	0.93	0.93	0.070	0.97

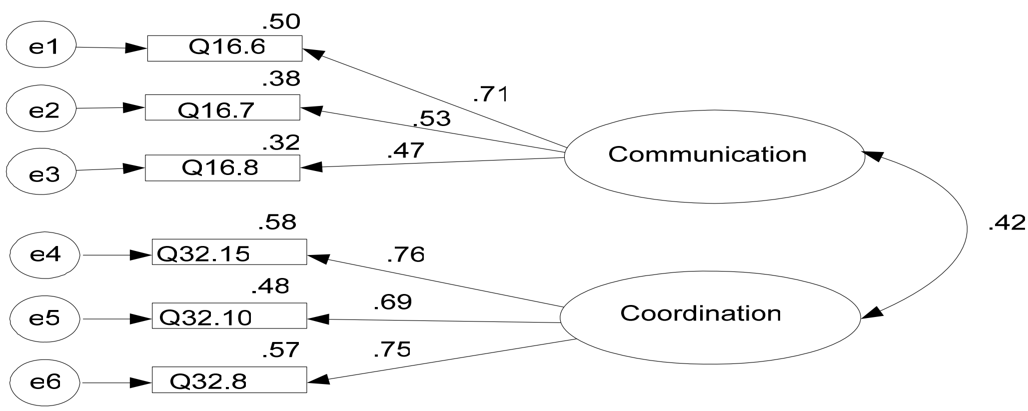


Figure 6.11 Communication and Coordination Latent Factors: Measurement and Structural Model

6.8.1.1.3 Confirming Latent Factor 'Collaboration'

CFA and SEM are used to find the fit of the model as shown in Figure 6.12 The minimum is achieved in reaching a convergent solution; $\chi2$ (80)=143.8, is significant (p=.000), as we expected, but $\chi2$/df=1.79; RMSEA is 0.06, CFI=.95, the parsimony adjusted Comparative Fit Index is .72 (cut off PCFI >.50), and Factor Reliability=.86. The Square Multiple Correlations R2 values are reasonably high, indicating that the model is accounting for a sufficient proportion of the variance. Standardised regression weights for all structural paths are in the same direction and together with R2 values are shown in Figure 6.12. The factor loadings confirmed strong relationships between the four latent factors and the Collaboration subdimension. A review of all other parameters showed that all the estimates are reasonable and statistically significant. For clarity purposes, error covariances are not shown.

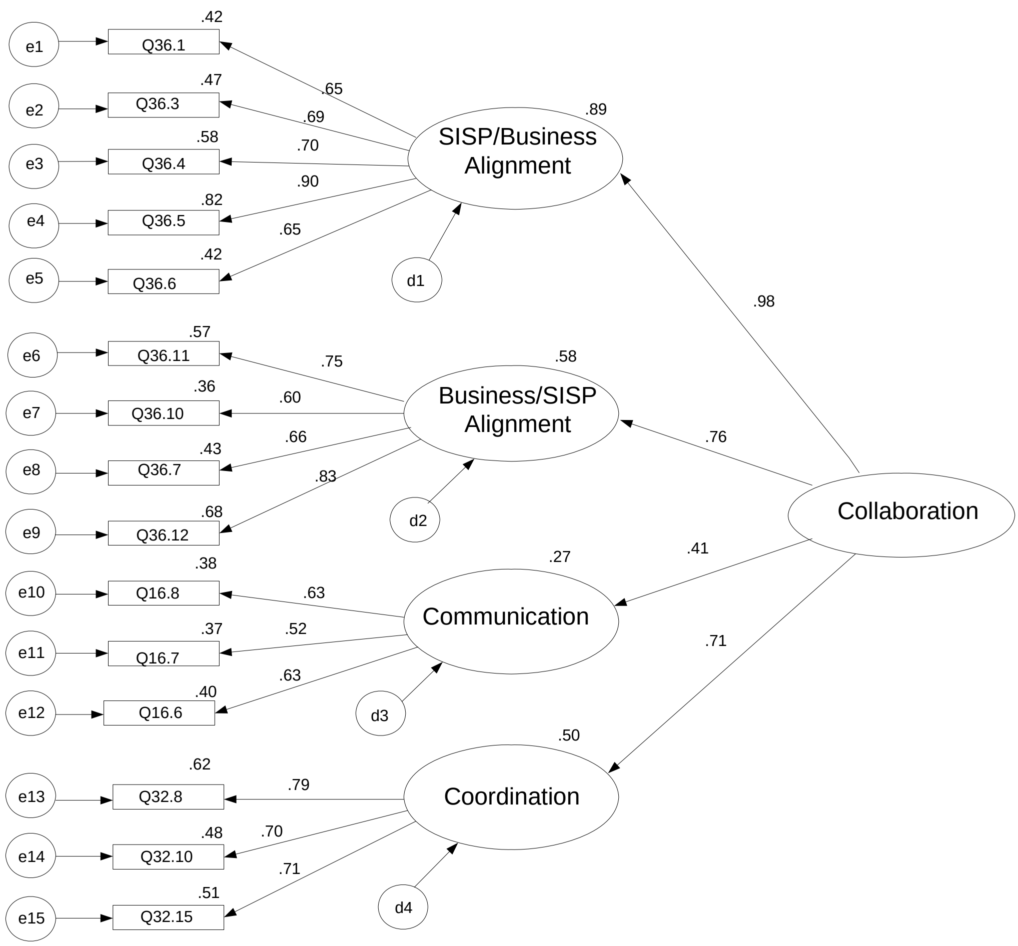


Figure 6.12 SISP Collaboration: Measurement and Structural Model

6.8.1.2 SISP Form and Content

The output of SISP is a written document which varies in size considerably from 10-100 or more pages. The size of the document and the scope (content) is influenced by many factors. As stated in Chapter 4, the Form & Content construct is a measure of the plan quality and is investigated mainly through the Approach and Content dimensions. The ANH/ANP model for SISP assessment only judged the importance of applying an approach against each level of SISP maturity. The study also investigates the importance of different approaches for Australian organisations. This section explores the contribution of approaches to make SISP more successful.

6.8.1.2.1 SISP Approaches

The questionnaire deployed five approaches (Earl, 2000) in an explicit form. A single question is used as a measure of the respondent's perceptions of the SISP approach. The aim is to have a single item measure for theANP/AHP application and to assess how widely this theoretical nomenclature is recognised in practice. Frequency analysis is performed and the results received are unexpected. 49.74% of respondents did not use any of Earl's approaches (Organisational, Business led, Administrative, Method driven and Technological approaches). 31.08% of responses indicated some use and 25.18% indicated full use of these approaches. The Administrative approach scored the last position and the most used approach is Business Led (Table 6.48). No alternatives were specified, with the exception of two respondents who specified 'Other', 'Budget constraints' and 'SAP modules'. Further analysis showed that 20.11% of the surveyed organisations used two different approaches simultaneously and 14.37% used a combination of three or more approaches.

A detailed frequency analysis revealed some important insights. About 50% of the surveyed population use 'Earl's' approaches and about 75% of respondents confirm the use of 'an approach', which means that 25% of the population use other than Earl's approaches and only 25% of them did not use any approach.

Table 6.48 SISP Approaches: Descriptive Statistics

Approach	Scale	Response (%)	Response (Relative 100 %)	Mean	Std. Deviation
Business led	Not Used	34.48	6.90	2.05	0.86
	To some degree Used	25.86	5.17		
	Used	39.66	7.93		
Organisational	Not Used	41.38	8.28	1.82	0.78
	To some degree Used	35.63	7.13		

Approach	Scale	Response (%)	Response (Relative 100 %)	Mean	Std. Deviation
	Used	22.99	4.60		
Technological	Not Used	47.13	9.43	1.74	0.78
	To some degree Used	32.18	6.44		
	Used	20.69	4.14		
Method driven	Not Used	60.92	12.18	1.56	0.77
	To some degree Used	21.84	4.37		
	Used	17.24	3.45		
Administrative	Not Used	59.77	11.95	1.51	0.86
	To some degree Used	29.89	5.98		
	Used	10.34	2.07		

Earl (2000) suggested that practitioners should combine the approaches he had recognised. This study confirms that this actually happens in about 35% cases in Australia. The most used combinations are: Organisatiotional and Business-Led; Organisatiotional, Business Led and Method Driven; and Organisatiotional, Business Led, Administrative and Technological. Also, Earl suggested that the Organisational approach could be the most successful. The data support the Business led approach as the most used approach. This could be a very important finding if this study confirms that this approach is the most successful one. Even if there is no universal approach applicable to all organisations, the most successful approach could be a starting point in tailoring the approach to the specific needs of the organisation.

In general terms, the findings of this study shows that SISP is somewhat evolved and Earl's approach categorization is confirmed in Australian practice. Work done by Warr (2006) has similar findings for the UK environment.

Table 6.49 is established to address the hypothesis H2. The definition of H2 is:

H2	The existence of a formal approach to SISP planning will have a favourable effect on the overall success of SISP.

All correlations shown in Table 6.49 are statistically significant at the 0.01 confidence level, except where no specific SISP approach is listed. Consequently, the statistics for the 'No SISP approach used' associated with SISP success is due to chance.

Table 6.49 SISP Approaches and SISP Success Relationships

	SISP Success	Correlation
	Mean	Spearman's rho
Organisational		0.33*
Not Used	3.14	
To some degree used	3.77	
Used	3.65	

	SISP Success	Correlation
	Mean	Spearman's rho
Business-Led		0.23*
Not Used	3.17	
To some degree used	3.71	
Used	3.61	
Administrative		0.29*
Not Used	3.29	
To some degree used	3.85	
Used	3.56	
Method Driven		0.27*
Not Used	3.32	
To some degree used	3.79	
Used	3.67	
Technological		0.25*
Not Used	3.27	
To some degree used	3.71	
Used	3.61	
No specific SISP approach		0.039NC
Not Used	3.44	
To some degree used	3.85	
Used	3.52	

* Correlation is significant at the 0.01 level (2-tailed).
NC Correlation is not significant

Table 6.49 shows a favorable effect of approaches on the success of SISP. The values for correlations are relatively small but are significant, indicating that this model is too simple to explain all variation of SISP success by the SISP approach used, which is expected. Correlations in Table 6.49 are shown at the item level to gain more insights into relationships. Correlation between the factors (SISP approach and SISP success are unidimensional factors) is 0.358, at the 0.01 level. Thus, the H2 hypothesis cannot be rejected. The relationship between SISP approach and SISP success has been confirmed in the SISP literature (Warr, 2006). Also, Table 6.49 confirms that different SISP approaches are differently associated with SISP success.

In addition, the H2 hypothesis is confirmed by SEM. An excellent data fit of the model, shown in Figure 6.13 and Table 6.50 indicates a strong positive relationship between SISP success and SISP approach. (Note: all other relevant statistics are shown in Appendix G).

Table 6.50 SISP Success/Approach Structural Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Success/Approach	7.98	8	0.435	0.99	0.017	0.985	0.96	0.97	0.000	1.00

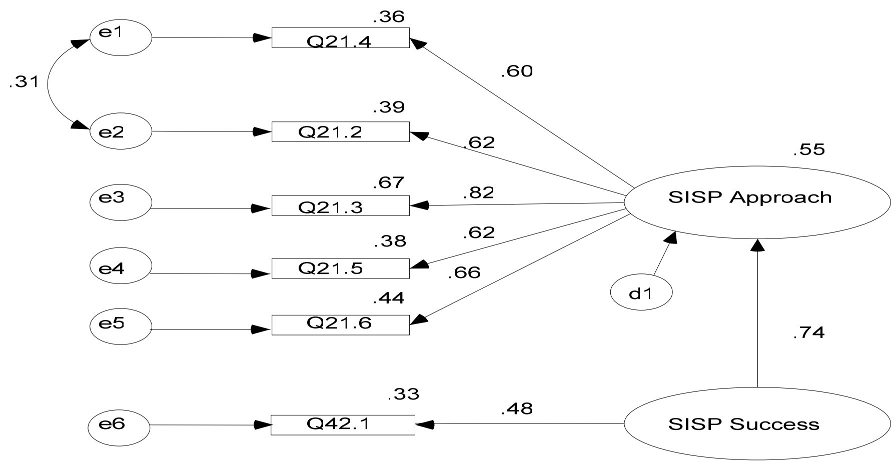


Figure 6.13 SISP Success/Approach: Measurement and Structural Model

It has been suggested that SISP objectives influence SISP approaches; i.e. different combinations of objectives are associated with different SISP approaches (Earl, 1993). This association is tested in this study. The results confirm the existence of that relationship (Spearman's rho 0.438, significant at the 0.01 level).

Several criteria can be used to measure which approach is most successful. One criterion is the total mean value. However, this mean includes the scales 'not used' and 'to some degree used' as well as 'used'. A clear indication of SISP success can only be assessed in a situation where an approach is clearly 'used'. There is no value to judge the success of the approach using the 'to some degree used' scale as it, after all, represents a 'mixture' of different approaches with no clear 'degree' of contribution. Thus, by measuring and comparing mean values for the 'used' scale only (Figure 6.14), quite different results are obtained in comparison with the mean values shown in Table 6.48.

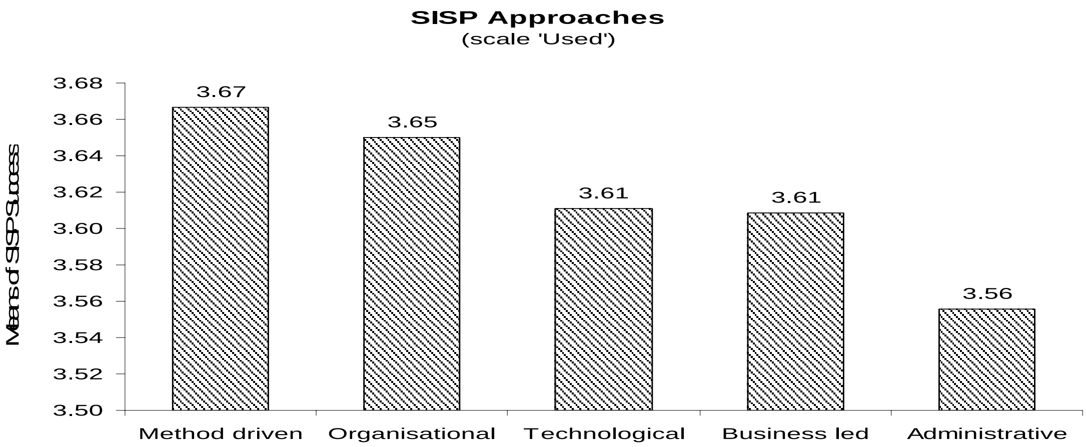


Figure 6.14 SISP Approaches and SISP Success (means)

Figure 6.14 indicates that there is no big difference in the means between approaches. A small lead of the Method driven approach came as a surprise. Earl (2000) found that the Method Driven and Administrative approaches shared the 4th position, the Business-Led approach was in the second position while the Technological approach came in the third position. This study finds that the Business and Technological approaches share the third position. In both studies, the Administrative approach kept the last position.

In addition, this study explored SISP approaches and SISP success means for only ‘regular’ performing SISP organizations. The rank order was very similar: the first and second positions were kept, the business led approach came third, while technological and administrative approaches shared the fourth position.

SISP practice is not static, and the direction of its evolvement could be predicted. In an effort to understand why the Method driven approach can help SISP more than others, the following sentence stands out in regard to the Method Driven approach: ‘...formal strategy studies could leave behind embryonic strategic thrusts, ideas waiting for the right time, or new thinking that could be exploited or built upon later in unforeseen ways’ (Earl, 2000:227). Maybe that right time is already here.

The Business led approach achieved the highest mean value against the most advanced SISP maturity level (Table 6.51). Checking for a percentage of only a ‘used’ scale, the conclusion is the same: the Business Lead approach is a bit ahead of an Organisational approach in terms of SISP maturity. A more complete picture is obtained by observing the crosstabulation between SISP maturity levels and approaches shown in Figure 6.15. The figure shows, for example that the Method Driven approach is equally used in the Attainable and Sustainable maturity planning stages. This figure represents the current situation in the Australian SISP arena; it should not be read that the Adaptable planning requires less formal use of approaches than the other SISP maturity stages. Figure 6.15 shows that SISP has evolved and that the recent calls of all researchers to align SISP with business planning have a big influence in practice, reflecting the business is leading IS and not the other way around.

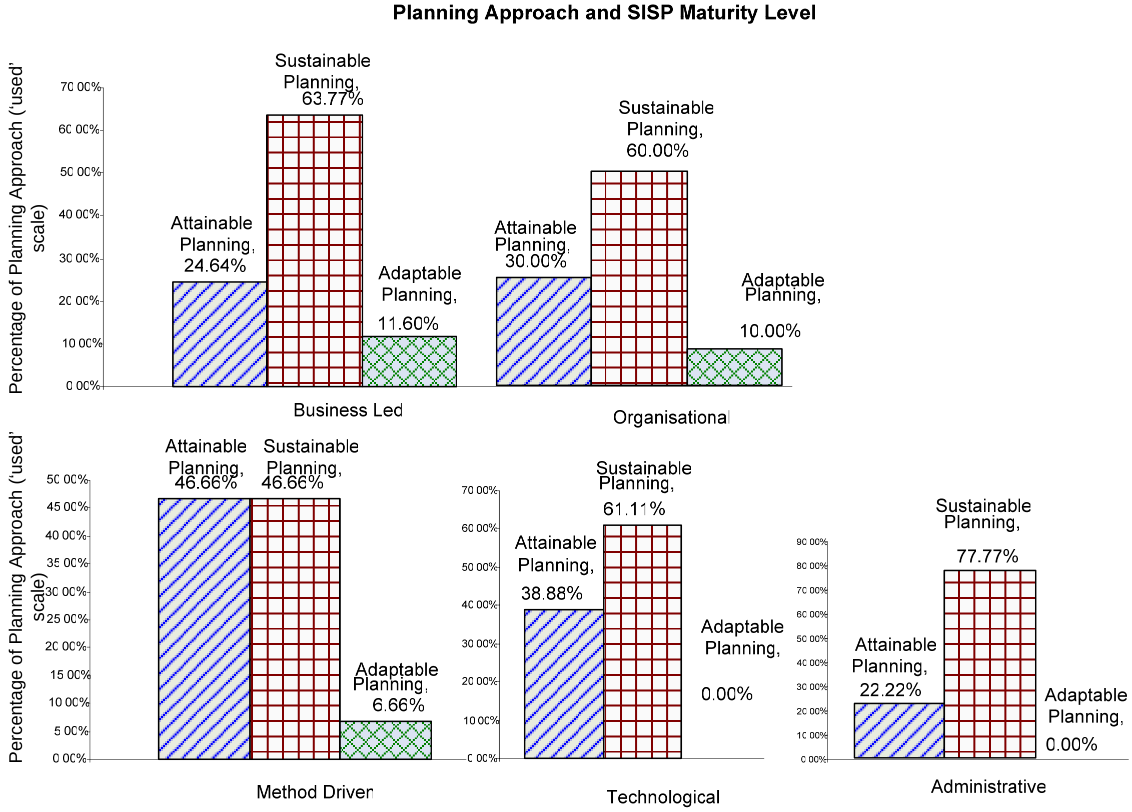


Figure 6.15 SISP Approaches and SISP Maturity Levels Crosstabulation

Table 6.51 also demonstrates that the Method driven and Technological approaches may not be distinguishable in Adaptable planning. Similar observations are reported (Doherty et al., 1999), where the 'systematic' approach which combines the characteristics of the Method driven and Technological approaches is identified. Ward and Pepard's (2002:125) concluded that the 'systematic' approach identified by Doherty et al. (1999) could be reasonable "…given that, over the last decade, many large application and utility software packages have effectively become part of the infrastructure". Consequently, it can be stated that there is a high level of consistency between this study and Earl's and Doherty et al. findings.

Table 6.51 Mean Crosstabulation between SISP Approaches and SISP Maturity Levels.

SISP Maturity Level	Organisational Mean	Business Led Mean	Administrative Mean	Method Driven Mean	Technological Mean
Attainable Planning	1.41	1.58	1.21	1.44	1.44
Sustainable Planning	2.14	2.39	1.77	1.64	1.98
Adaptable Planning	2.25	3.00	1.50	2.00	2.00
Spearman Correlation Rho	0.49*	0.51*	0.41*	0.21*	0.39*

* Correlation is significant at the 0.01 level (2-tailed).

Figure 6.16 is a graphical plot of the total SISP approaches used against the SISP maturity levels. This visual presentation shows the high mean of the 'to some degree used' scale. Except for the Business-Lead approach, these values are higher than for 'used' scale. This phenomenon leads to the confirmation, that in practice combinations of different approaches are used more often than a single approach. In another words, 'the borders and boundary lines' that distinguish approaches have begun to blur.

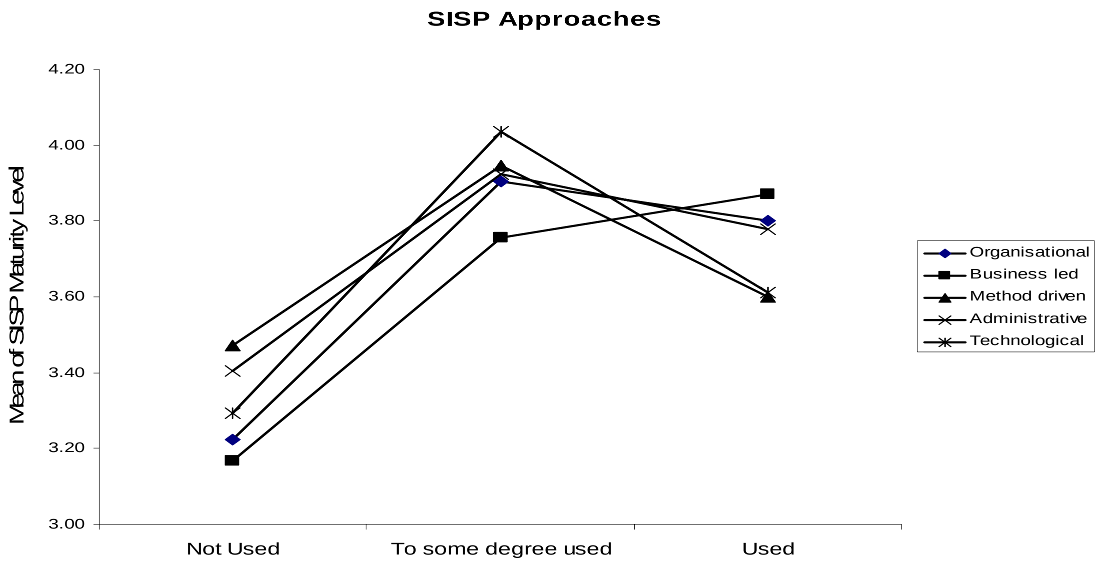


Figure 6.16 SISP Approaches and SISP Maturity Levels (Means)

This study takes a step further; it investigates the covariance between these five approaches. This could reveal emerging relations between the approaches. The model depicted in Figure 6.17 shows the SISP success construct and the SISP approach subdimension.

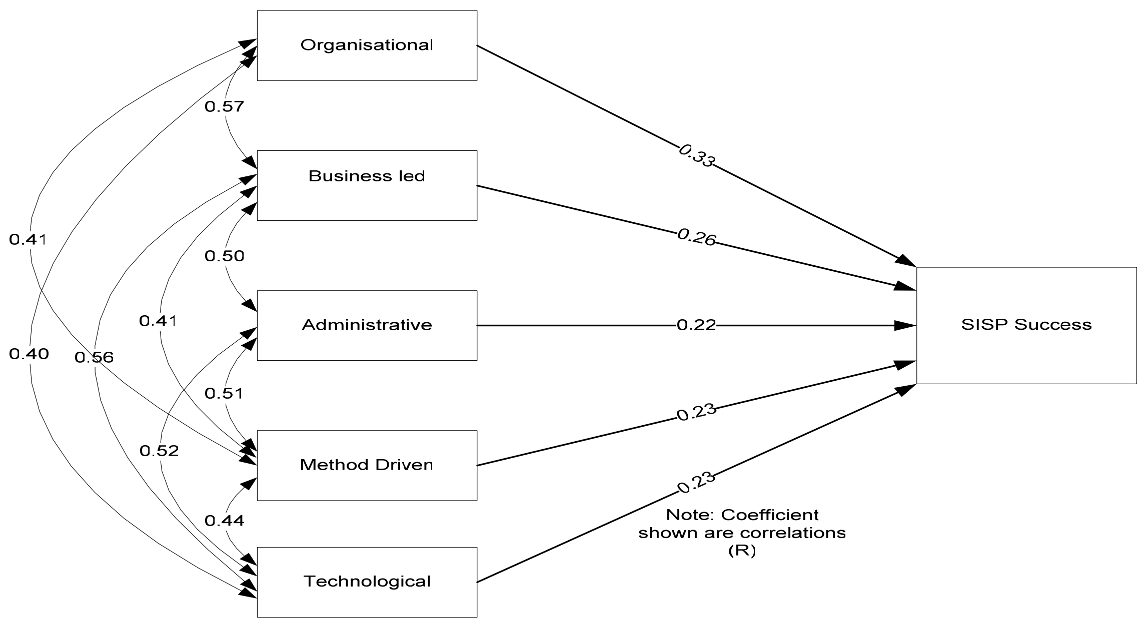


Figure 6.17 SISP Approaches and SISP Success Correlations

It is important to point out that this model shows the correlation and covariance between the model components independently of the model itself. The covariance between Administrative and Technological, and between Organizational and Business-Led approaches is strongest. The latter relationship is expected due to the influence of the publicized importance of business and IT alignment. The former relationship shows that Administrative approach has a strong influence on Organizational (and other) approaches. Certain overlapping between approaches has been reported in the SISP literature but such a strong influence of the Administrative approach has not been reported so far. This could be an indication that organizations now 'value' more the detailed IS planning and that every approach has some 'administrative' elements like identifying 'where IS/IT is most critical in meeting short to medium-term needs' (description of the Administrative approach from Ward and Pepard, 2002:125). Also, the Administrative approach often results in systems that are implemented (Powell and Powell, 2004). Generally speaking, a strong covariance between the SISP approaches may indicate the evolving nature of SISP practice: organizations apply more than one approach and they try to take the best from the different approaches to tailor for their needs. This view is confirmed by the explicit survey statistics which shows that only 55.2% of respondents are satisfied with the current approach and 11.5% are agreed or strongly agreed that the approach followed was not satisfactory. Others (33.3%) are undecided (Neither Agree or Disagree). Also 23% of organizations are considering changing the SISP approach to improve SISP.

6.8.1.2.2 Company Size and SISP Approaches Relationship

Table 6.52 demonstrated that, generally there is no significant relationship between the SISP approach and the company size. The tendency that large companies more often chose the Business-Led approach is due to chance and does not reflect reality in this sample. Only the relationship between the Technological approach and company size is significant at the 0.05 level.

Table 6.52 SISP Approaches and Company Size Relationships

	Company Size			Spearman Correlation
	Small	Medium	Large	
Business led	1.80	2.00	2.20	0.13
Technological	1.40	1.69	1.89	0.16*
Organisational	2.20	1.78	1.82	-0.03
Method driven	1.60	1.46	1.75	0.16*
Administrative	1.60	1.50	1.50	-0.01

* Correlation is significant at the 0.05 level (2-tailed).

Thus, it could be said that the selection of a SISP approach is not governed by company size. Neither Doherty et al. (1999) nor Earl (1993) investigated the relationships between the SISP approaches and size of organisations, thus the findings of this study should be confirmed with more rigorous testing.

6.8.1.2.3 SISP Methodologies

One or more methodologies constitute an approach and as pointed out by Lederer and Sethi (1992), to effectively perform SISP, organizations need to follow a well-defined methodology. Generally, more than one SISP methodology is used within one organization. Also, the commonly used methodologies in education or government organizations are not suitable for production-base or commercial environments (Robson, 1997). Still, there are many general SISP methodologies which can be utilized in every environment, perhaps with some customization.

The SISP literature generally categorizes Bottom-up, Top-down and Inside-out as methodologies or methods. This study rather uses the term ‘planning style’ for them. These ‘planning styles’ are ranked as methodologies but later a separate consideration is given to them.

This study finds that the highest ranked used methodology is Information System Planning, followed by SWOT analysis and a combination of Bottom-up and Top-down styles (Table 6.53). Lederer and Sethi (1988) in their extensive study of implementation problems of SISP methodologies mentioned that Business Systems Planning (IBM, 1975), Strategic Systems Planning (Holland System Corp, 1986), and Information Engineering (Martin, 1982) accounted for half of the responses to their survey. Commercial IS planning methodologies are used in only 22% of cases (Premkumar and King, 1991), and the rest use in-house developed methodologies. In that survey, the most used methodologies were: Information Engineering (12%), Business Systems Planning (8), CSF (6) and Value Chain (6%).

In this study the use of the Business Systems Planning (BSP) is ranked sixth, and the Information System Planning (also the IBM methodology), is ranked as the number one used methodology. Surprisingly, Information Engineering, Method/1 and 4 Front are in the last positions. Smits et al. (1997) confirmed that methodologies such as BSP were previously used but were abandoned. Also, they reported the low use of standard planning methodologies (22%). This study finds slightly higher use of the methodologies listed in Table 6.53.

Table 6.53 The SISP Methodology Use Ranking in Australian Organisations

Rank	Methodology	Mean	Percent of Use*	Relative % of Use
1	Information Systems Planning	1.97	59.77	9.01
2	SWOT analysis	1.95	56.32	8.49
3	Combination bottom-up top-down	1.85	49.43	7.45
4	Top-down	1.80	50.57	7.63
5	Technology assessment IS infrastructure review	1.72	47.13	7.11
6	Business Systems Planning	1.67	41.38	6.24
7	Bottom-up	1.61	41.38	6.24
8	Staged Approach	1.57	35.63	5.37
9	Business Portfolio Analysis	1.46	28.74	4.33
10	Current portfolio evaluation	1.46	28.74	4.33
11	Executive Information Planning	1.45	31.03	4.68
12	Balanced Scored analysis	1.44	27.59	4.16
13	IS Investment Strategy	1.43	27.59	4.16
14	Resource Life Cycle	1.38	24.14	3.64
15	BIA Integration Technique	1.31	20.69	3.12
16	Value Chain Analysis	1.30	18.39	2.77
17	Information Quality Analysis	1.28	18.39	2.77
18	Ends Means Analysis	1.17	11.49	1.73
19	Inside-out	1.17	10.34	1.56
20	Fuzzy Cognitive Maps	1.15	11.49	1.73
21	Information Engineering	1.10	6.90	1.04
22	BI Characterization Study	1.08	6.90	1.04
23	Information Engineering WorkBench IEW	1.07	4.60	0.69
24	Method_1	1.06	3.45	0.52
25	4 Front	1.01	1.15	0.17
	Total			**100**

* Used and to some degree used responses counted

The average percentage of 'used' and to 'some degree used' is 26.5 % (graphically presented in Figure 6.18). However, Flyn and Goleniewska (1993) reported the 89% use of a methodology or technique (56% in-house and 33% SISP technique) in 18 UK organizations. Obviously, the size of the sample should be taken into account when interpreting these results.

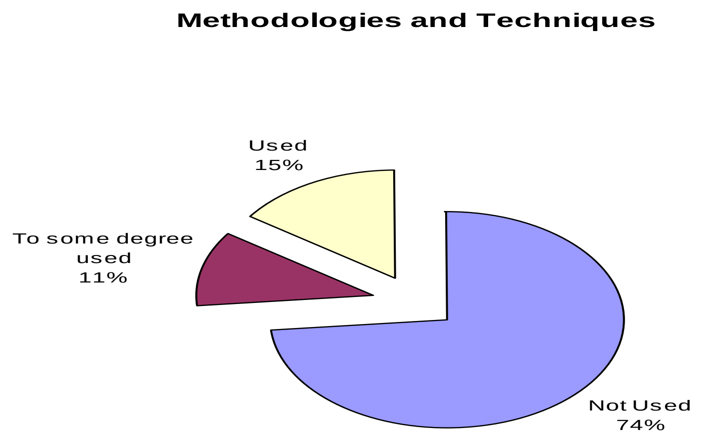


Figure 6.18 SISP Methodologies and Techniques Distribution of Use

The literature review in Chapter 3 indicated that the use of formal (packaged) methodologies may be declining with advances in SISP. The low position of these methodologies may be a sign that organisations now more often deploy informal methodologies. This study formally tests that hypothesis defined as:

H3	As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases**.**

Table 6.54 presents the mean values for each assessed methodology against the SISP planning levels. The Spearman correlation is statistically significant for all entries except for the Balanced Scored Analysis and 4 Front.

Table 6.54 Relationships between SISP Methodologies and SISP Maturity Levels

	Attainable Planning	**Sustainable Planning**	**Adaptable Planning**	**Spearman Correlation**
	Mean	Mean	Mean	rho
Information Systems Planning	1.54	2.30	2.50	0.44**
Top-down	1.56	1.95	2.50	0.28**
Bottom-up	1.33	1.77	2.50	0.37**
Business Portfolio Analysis	1.10	1.68	2.50	0.45**
Combination bottom-up top-down	1.54	2.09	2.25	0.31**
SWOT analysis	1.49	2.36	2.00	0.43**
Technology assessment IS infrastructure review	1.38	2.00	2.00	0.36**
Staged Approach	1.18	1.89	2.00	0.43**
Executive Information Planning	1.13	1.68	2.00	0.41**
Current portfolio evaluation	1.15	1.68	2.00	0.35**
Balanced Scored Analysis	1.36	1.45	2.00	0.12NC
Value Chain Analysis	1.13	1.39	2.00	0.27**
IS Investment Strategy	1.23	1.57	1.75	0.25**
Inside_out	1.00	1.27	1.75	0.35**
Business Systems Planning	1.33	1.98	1.50	0.34**

	Attainable Planning	Sustainable Planning	Adaptable Planning	Spearman Correlation
	Mean	Mean	Mean	rho
Resource Life Cycle	1.10	1.61	1.50	0.35**
Information Quality Analysis	1.13	1.39	1.50	0.26**
Fuzzy Cognitive Maps	1.00	1.25	1.50	0.36**
Method_1	1.00	1.07	1.50	0.22**
BIA Integration Technique	1.15	1.48	1.00	0.19*
Ends Means Analysis	1.05	1.30	1.00	0.21**
Information Engineering	1.00	1.20	1.00	0.21**
BI Characterization Study	1.00	1.16	1.00	0.21**
Information Engineering WorkBench IEW	1.00	1.14	1.00	0.17*
4 Front	1.00	1.02	1.00	0.09NC

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.

From Table 6.54 it can be seen that mature SISP uses a variety of methodologies. In ten out of twenty five cases, Adaptable planning shows smaller mean values in comparison to Sustainable planning. This certainly could indicate the tendency of less use of packaged methodologies at advanced SISP planning level, but it is not sufficient evidence to reject the null hypothesis. Table 6.54 neither confirmed the monolithic decrease of the use of packaged methodologies across all SISP maturity stages, nor confirmed the consistent decline in all cases of Adaptable planning. If H3 is respecified to:

H3a	The highest level of SISP maturity tends to decrease the use of formal (packaged) methodologies**.**

it will have grounds not to be rejected.

Table 6.55 presents the most favoured methodologies and planning styles for different SISP maturity stages obtained by sorting the data in Table 6.54. Spremic and Strugar (2002) found that Bottom-up (9.8%), Top-down (29.4) and a combination of the two (54.9) are ranked in that order in Croatia. Teo et al. (1997) reported the opposite ranking order and 69% of the companies they surveyed adopted a combination of top-down and bottom-up planning methodologies. This study finds that nearly all planning styles are used in the same percentage in Australia. Bottom-up is used slightly more (35.77%), then Top-down (34.96%) and then a combination of both (29.27%).

Table 6.55 SISP Maturity Levels Favoured Methodologies

SISP Maturity Stage	Favoured Methodology	Mean	Percentage used*
Attainable Planning	Information Systems Planning	1.54	37.14%
	SWOT analysis	1.49	34.29%
	Technology assessment IS	1.38	28.57%

SISP Maturity Stage	Favoured Methodology	Mean	Percentage used*
	infrastructure review		
Sustainable Planning	SWOT analysis	2.36	35.00%
	Information Systems Planning	2.3	36.00%
	Technology assessment IS infrastructure review	2	29.00%
Adaptable Planning	Business Portfolio Analysis	2.5	37.50%
	Information Systems Planning	2.5	37.50%
	SWOT analysis	2	25.00%

* Percentage calculated for sum of 'used' and 'to some degree used'

Considering the success of the Inside-out style (Table 6.57) it could be suggested that Adaptable planning should be associated with the Inside-out style of planning which promotes the identification of new opportunities. But, the data in Table 6.56 is a reflection of the current situation in Australian SISP practice, where Adaptable planning is just evolving.

Table 6.56 SISP Maturity Levels Favoured Planning Styles

SISP Maturity Stage	Favoured Planning Style	Mean	Percentage used*
Attainable Planning	Top-down	1.56	41.94%
	Combination bottom-up and top-down	1.54	38.71%
	Bottom-up	1.33	19.35%
Sustainable Planning	Combination bottom-up and top-down	2.09	34.57%
	Top-down	1.95	34.57%
	Bottom-up	1.77	30.86%
Adaptable Planning	Bottom-up	2.5	33.33%
	Top-down	2.5	33.33%
	Combination bottom-up top-down	2.25	33.33%

* Percentage calculated for sum of 'used' and 'to some degree used'

It is important to know the most successful methodologies, i.e. which ones from the list score the highest mean in relation to overall SISP success.

Table 6.57 shows that the most popular methodologies are not the most successful ones. The most popular methodologies are business oriented (alignment methodologies). However, the most successful methodologies are result oriented (impact) methodologies. The highest rank is associated with Method/1 and Inside-out planning style. The third and the forth position is occupied by the Fuzzy Cognitive Maps and the Information Engineering methodology. These methodologies are not in much use.

Table 6.57 Relationships between SISP Methodologies and SISP Success

	SISP Success	
	Mean	Spearman's rho
Method_1	5.00	0.28**
Inside_out	4.50	0.35**

	SISP Success	
	Mean	Spearman's rho
Fuzzy_Cognitive_Maps	4.33	0.31**
Information_Engineering	4.33	0.18*
Ends_Means_Analysis	4.20	0.28**
Information Engineering WorkBench IEW	4.00	0.02NC
Executive_Information_Planning	3.92	0.20**
Value_Chain_Analysis	3.90	0.20**
Current_portfolio_evaluation	3.87	0.19**
Staged_Approach	3.84	0.20**
Resource_Life_Cycle	3.83	0.27**
Technology_assessment_ IS_ infrastructure review	3.82	0.26**
Top_down	3.81	0.30**
Business_Portfolio_Analysis	3.80	0.19*
Balanced_Scored_analysis	3.79	0.28**
BIA_Integration_Technique	3.78	0.18*
IS_Investment_Strategy	3.77	0.20**
Bottom_up	3.76	0.25**
Combination_bottom_up_top_down	3.74	0.30**
SWOT_analysis	3.74	0.27**
Business_Systems_Planning	3.73	0.32**
Information_Systems_Planning	3.69	0.31**
Information_Quality_Analysis	3.63	0.18*
BI_Characterization_Study	3.00	0.09NC
4 Front		-0.08NC

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
NC Correlation is not statistically significant.

On the other hand, the most popular Information System Planning is the third from the bottom of the success list. Those results may not be as contradictory as they might seem at first glance. On the contrary, they can make perfect sense. For a number of decades, SISP was not a successful process. The use of the wrong methodologies significantly contributed to SISP failures and there was a call within the SISP literature for improving its methodology (Lederer and Sethi, 1992; Watson et al., 1997; Reich and Benbasat, 2003; Orlikowski and Iacono, 2001; McBride, 1998). This study confirms that the methodologies used were not so successful in Australia (satisfied 55.2%, neutral 33.3%, dissatisfied 11.5%), but still they are more successful in comparison to the results reported in other studies (i.e. satisfied 54%, neutral 23%, dissatisfied 23%, Lederer and Sethi, 1999).

Only 62.07% of organizations disagreed that the chosen SISP methodology contributed to failure, 32.2% are undecided and 5.7% believed that SISP methodology contributed to SISP failure. Also, even 26.4% of respondents agreed that they have not been aware of the existence of different SISP methods (38% undecided), 12.6 % of respondents stated that they are developing new methodologies to tailor to their specific needs.

In addition, the reason why the most popular methodologies are not the most successful ones could be due to the fact that organisations are not able to diagnose (measure) the unsatisfactory effect of methodologies they employed. The SISP measurement has been reported as one of the critical issues and the need for the improvement of measurement is also acknowledged in the SISP literature (Willcocks, 2000; Faulkner, 2002; Sweat, 2002).

SISP practitioners may benefit from knowing that emerging (result oriented) methodologies such as Fuzzy Cognitive Maps and Information Engineering can improve the success prospects of SISP.

6.8.1.2.4 SISP Content

SISP content is specific to every organisation, yet, organisations belonging to the same industry type (i.e. manufacturing) may have many SISP content similarities. Even so, the SISP content generalisation across all types of organisations is possible. Therefore, the study can only investigate SISP content in very broad terms. Thus, the survey questions are related to undertaking the feed forward study (analysis of all important existing components such as hardware, software, resources, etc. which could be useful for a proposed new system), the feed back study (analysis of existing components such as hardware, software, resources, etc, which must be changed/replaced) and the predictive study (what may affect the IS/IT function in the future and how the IS/IT function can respond to different proposed systems). Taking a predictive type of study assumes a more rigorous analysis of the external environment. This study does not investigate the SISP content characteristics on an individual bases as it was found (Gottschalk, 1999) that the individual content characteristics are not significant predictors of SISP implementation; only the overall content can be used to study relationships. In addition, the philosophy adopted for this study (ANP and overall SISP assessment) dictates the required depth of construct investigation. However, a definition of the individual content characteristics differs between the two studies. This generalisation allows testing H11 by means of the frequency of undertaking the predictive study. Hypothesis H11 is specified as:

H11	The more mature SISP is, the more the impact of external environmental factors is considered**.**

More strategic SISP plans will reflect not only technical but social issues (Somogyi & Galliers, 2003). More ‘tactical’ (less mature) plans will incorporate IT projects. Therefore, the study examines SISP content from this perspective as well.

Table 6.58 Relationships between SISP Content and SISP Maturity

	Attainable Planning	Sustainable Planning	Adaptable Planning	Mean	Spearman's rho
Feed back study	45.14%	99.21%	100%	0.56	0.43*
Predictive study	38.19%	80.61%	100%	0.46	0.33*
Feed forward study	34.72%	74.40%	100%	0.43	0.32*
IS Projects embedded in SISP	30.65%	68.15%	49.98%	3.11	0.42*
SISP addresses socio-technical issues	10.22%	40.89%	24.99%	2.62	0.37*
IT Projects embedded in business plan	22.99%	56.79%	74.96%	2.86	0.41*
SISP addresses only technical issues	12.77%	20.44%	0%	2.18	0.10NC

*Correlation is significant at the 0.01 level (2-tailed).
NC Correlation is not statistically significant.
** Relative Percentage (calculated as a percentage is out of 100% for SISP maturity level).
Note: Percentage is calculated for positive responses

Table 6.58 shows that all correlations with SISP maturity, except for SISP content which addresses only technical issues, are statistically high at the 0.01 level. All three types of studies are undertaken at 100% level at Adaptable planning organizations. The monotonically increase in the mean values across the SISP maturity levels for the predictive studies confirmed that the null hypothesis for H11 is rejected and the theory hypothesis supported. Also, the attention to all other SISP studies increases as the SISP maturity level increases.

Table 6.62 and Figure 6.19 are also confirmation from SEM of the existence of the relationships between SISP content and SISP maturity. All statistical indexes are large, indicating excellent fit of the model and support for the H11 hypothesis. Other relevant statistics are shown in Appendix G.

Table 6.59 SISP Maturity Level/SISP Content Structural Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Maturity/Content	14.77	11	0.193	0.13	0.015	0.976	0.94	0.97	0.04	.991

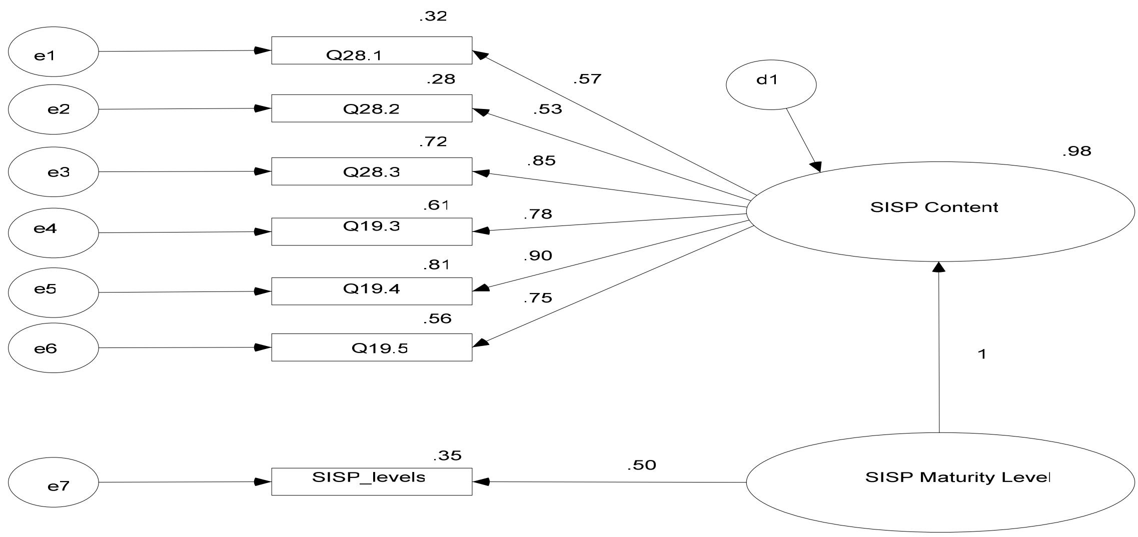


Figure 6.19 SISP Maturity Level/SISP Content: Measurement and Structural Model

A high percentage of cases where IS projects are embedded in SISP or business plans indicates that SISP in Australia is not highly ‘strategic’. That is also confirmed by the explicit question of whether the level of SISP planning is more ‘tactical’ or ‘strategic’. Only about 50% of respondents disagree that the SISP is more tactical in its content.

The big surprise is the response to the question about SISP addressing socio-technical issues. The low percentage of 25% for the Adaptable planning cannot be explained and supported by the SISP literature. It remains just as a fact that the Australian advanced SISP population does not significantly value inclusion of ‘social’ content in SISP plans.

All SISP content items and SISP success are significantly correlated at the 0.01 or 0.05 levels. Table 6.60 shows the mean values for SISP success at different content levels.

Table 6.60 SISP Content and SISP Success Relationships

	SISP Success		
	Scale	Mean	Spearman's rho
SISP addresses socio-technical issues	Strongly Disagree	3.00	0.22**
	Disagree	4.17	
	Neither Agree or Disagree	3.52	
	Agree	3.48	
	Strongly Agree	4.50	
SISP addresses only technical issues	Strongly Disagree	3.32	0.16*
	Disagree	3.52	
	Neither Agree or Disagree	3.71	
	Agree	3.50	
	Strongly Agree	3.50	
IS Projects embedded in SISP	Strongly Disagree	2.89	0.37**
	Disagree	3.83	
	Neither Agree or Disagree	3.61	
	Agree	3.53	
	Strongly Agree	4.00	

	SISP Success		
	Scale	Mean	Spearman's rho
IT Projects embedded in business plan	Strongly Disagree	3.09	0.29**
	Disagree	3.33	
	Neither Agree or Disagree	3.72	
	Agree	3.61	
	Strongly Agree	3.83	
Predictive study	Not Undertaken	3.28	0.28**
	Undertaken	3.73	
Feed forward study	Not Undertaken	3.18	0.54**
	Undertaken	3.89	
Feed back study	Not Undertaken	3.29	0.24**
	Undertaken	3.63	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

SISP can still be more successful if its content addresses socio-technical issues, rather than technical issues only. Also, performing predictive, feedforward and feedback studies will lead to more successful SISP. When it comes to the assessment of SISP regarding comprehensiveness (the level of specifying IS/IT projects within the SISP), the Australian reality supports more the ‘tactical’ way of producing SISP plans. In a way, Table 6.60 supports view that comprehensiveness is reported to be both, positively and negatively related to SISP success (Fredrickson, 1984). On the other hand, the suggestion from the literature review that the high level SISP plan should be rather a set of policies and guidance (McBride, 1998) is not supported by the SISP assessment time in Australia.

The study measured the relationship between the SISP content and SISP approach. It was found that the content is important for SISP approach (correlation 0.487 at the 0.01 level). This confirmed the work of Boyton and Zmud (1987).

Table 6.61 demonstrates the relationships of SISP content and size of organisations. The mean values for undertaking the predictive study indicate that larger companies may often undertake this type of studies, but the Spearman’s correlation coefficient is not statistically significant, suggesting that there is no relationship between the two.

Table 6.61 SISP Content and Organisational Size Relationships

	Company Size			
	Small	Medium	Large	Spearman's rho
	Mean	Mean	Mean	
Predictive study	0.20	0.44	0.54	0.14NC
Feed forward study	0.00	0.37	0.61	0.29*
Feed back study	0.00	0.50	0.79	0.37*
SISP addresses only technical issues	2.80	2.19	2.07	-0.06NC
SISP addresses socio-technical issues	2.00	2.52	2.93	0.18**

	Company Size			
	Small	Medium	Large	Spearman's rho
	Mean	Mean	Mean	
IS Projects embedded in SISP	2.20	2.91	3.68	0.32*
IT Projects embedded in business plan	2.40	2.59	3.46	0.32*

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).

Similarly, the Spearman's correlation rho is not significant for SISP content addressing only technical issues. All other items support relationships between SISP content and company size; larger companies tend to have more exhaustive SISP content. The relationships between SISP content and company size is tested on the factor level and found significant at the 0.01 level.

6.8.1.2.5 SISP Focus

The focus of SISP is an indication of the orientation of the SISP endeavour towards its goals. It can be defined as: 'the balance between creativity and control orientations inherent within the strategic planning system' (Chakravarthy, 1987 cited by Segars, 1998:308). Creativity is looking for opportunities and threats and then generating innovative solutions for competitive survival, and control is related to the regular accounting and budgetary systems (Segars, 1998). This study aggregates that view and the discussions on focus by others (Wilson, 1989) by defining three items for assessment as: focus on competitiveness, focus on strategic decision-making and focus on pure efficiency of IT processes.

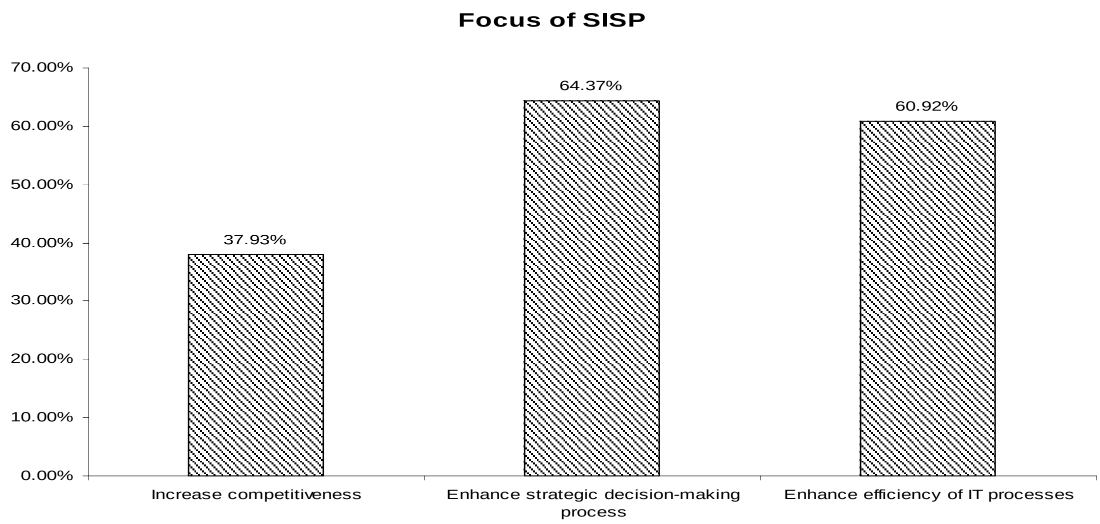


Figure 6.20 Focus of SISP

Obviously, those focuses are not mutually exclusive, but rather are predominant characteristics of planning. Figure 6.20 shows that SISP in Australia is predominantly focused on enhancing strategic decision-making processes. Conversely, SISP has a control orientation. A low percentage of 38% towards 'creativity' is not surprising and is in agreement with other findings in this study. It is worth investigating relationships between 'creativity' and 'control' for SISP success.

Table 6.62 SISP Focus Relationships with Company Size, SISP Success and Maturity Levels

	Company Size	**SISP Success**	**SISP Maturity Level**
	Spearman's rho	Spearman's rho	Spearman's rho
Increase competitiveness	0.24*	0.33*	0.52*
Enhance strategic decision-making process	0.34*	0.38*	0.56*
Enhance efficiency of IT processes	0.27*	0.28*	0.36*

* Correlation is significant at the 0.01 level (2-tailed).

Strong, positive, statistically significant relations are observed in the relationship between SISP focus and company size, SISP success, and SISP maturity levels (Table 6.62). To discuss these relationships Table 6.63, Table 6.64, and Table 6.65 are provided.

Table 6.63 SISP Focus and SISP Maturity Levels (means)

	SISP Maturity Level				
	Attainable Planning	Sustainable Planning	Adaptable Planning	Total	Std. Dev.
	Mean	Mean	Mean	Mean	
Increase competitiveness	2.10	3.50	4.00	2.90	1.38
Enhance strategic decision-making process	2.46	4.18	4.75	3.44	1.47
Enhance efficiency of IT processes	2.59	3.91	3.75	3.31	1.38

Table 6.64 SISP Focus and SISP Success (means)

	SISP Success				
	Very poor	Moderately poor	Neutral	Satisfactory	Very Good
	Mean	Mean	Mean	Mean	Mean
Increase competitiveness	1.00	2.00	2.54	3.45	3.38
Enhance strategic decision-making process	1.00	4.00	2.94	4.14	4.13
Enhance efficiency of IT processes	1.00	4.00	2.90	3.93	3.75

Table 6.65 SISP Focus and Company Size (means)

	Company Size					
	Small		Medium		Large	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Increase competitiveness	2.60	1.43	2.67	1.43	3.39	1.12
Enhance strategic decision-making process	2.80	1.69	3.11	1.53	4.18	0.97
Enhance efficiency of IT processes	2.80	1.55	3.04	1.48	3.93	0.85

It seems that SISP success is based more on control orientation than on creativity. Certainly, balance is needed, but the current SISP environment indicates that more emphasis should be towards control, i.e. enhancement of decision- making processes should be more prioritised then looking at how SISP can increase competitiveness. Different SISP evolution levels have different focus intensities. For example, Attainable planning is more focused on enhancing efficiency of IT processes than supporting a decision-making process. As company size increases, the focus on a chosen orientation becomes stronger. Generally, small companies are more conscious towards efficiency of the IT processes than larger companies.

6.8.1.2.6 Confirming Latent Factor 'Form & Content'

'Form & Content' as a module of 'Effectiveness' dimension is measured through three perspectives: SISP focus, SISP content and SISP approach. The goodness of fit statistics shown in Table 6.66 and the factor loadings shown in Figure 6.21 indicate that the proposed model fits the data. A review of all other parameters shows that all estimates are reasonable and statistically significant. For clarity purposes, error covariances are not shown.

Table 6.66 SISP Form and Content Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Form & Content	277.56	145	0.00	1.91	0.051	0.91	0.88	0.89	0.07	.94

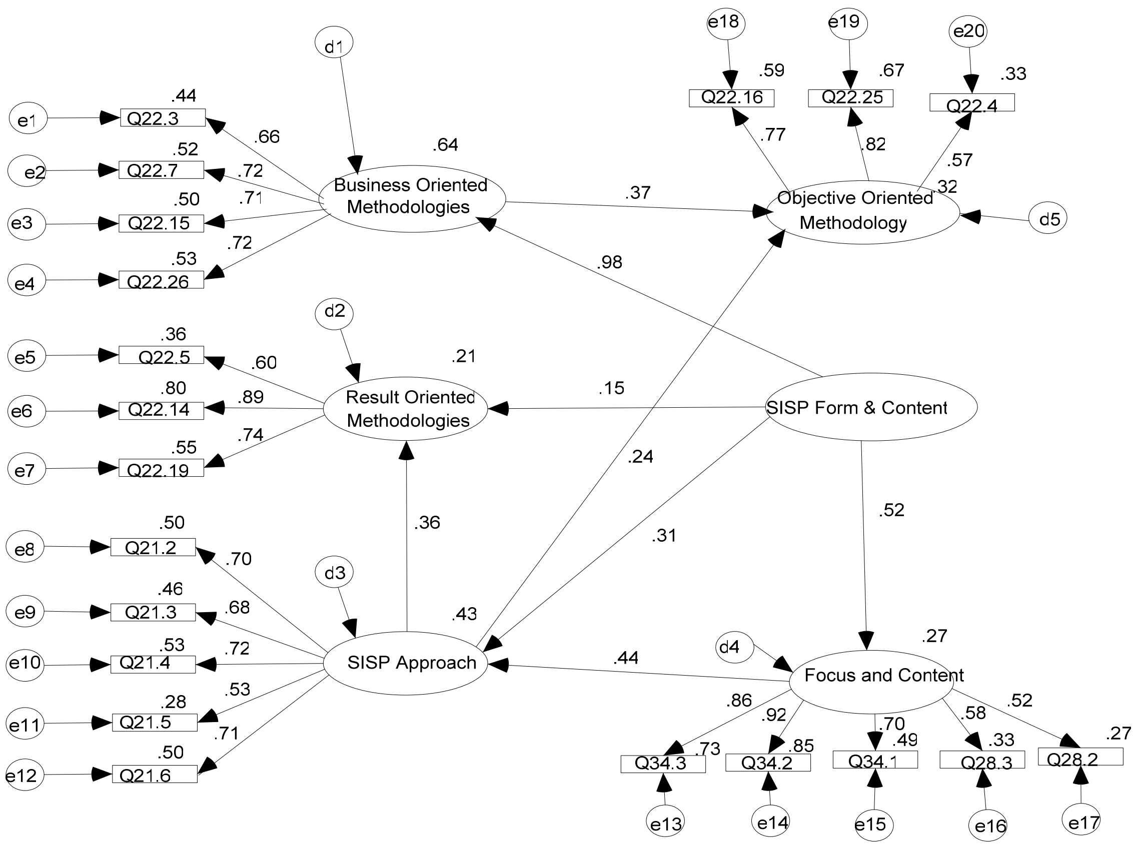


Figure 6.21 SISP Form and Content: Measurement and Structural Model

6.8.1.3 Policy

The establishment of the right policies for IS/IT is one of the most critical issues (Neumann et al., 1992). Adequate policies can provide effective and efficient directions for SISP formation and can be regarded as an essential contributor to successful SISP implementation. As SISP outputs can be seen as a set of policies, it can be said that vision, mission, objectives, policies and strategy are building blocks of SISP. From a high level, where strategy can be expressed as a 'plan of action or policy in business or politics etc.' (The Concise Oxford dictionary, 1990), to a low level, where procedures and guidelines to manage priorities set are the translation of organisational policies, it can be said that policies will influence effectiveness and efficiency of all SISP processes.

About every aspect of SISP planning can be governed by certain policies. This can have positive and negative implications on SISP. Too many procedures can impede SISP as planning can loose flexibility, creativity and inspiration to be proactive. On the other hand, planning without clear policies and responsibilities can drift in the opposite direction. External regulatory and internal policy requirements have different impacts on SISP processes. This study does not perform an evaluation of SISP policies, but rather the perceptions of policies. Thus, Table 6.67 only lists distinctive policies which can influence SISP success.

Table 6.67 SISP Related Policies: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Dev.
Promoting new ideas and knowledge sharing	260	1	5	3.22	1.36
Cost saving and reuse where appropriate	260	1	5	3.22	1.41
Promoting cordial relationships between different departments	260	1	5	3.06	1.35
Clear communications on all policies and responsibilities	260	1	5	3.00	1.33
Innovative approach in solving customer problems	260	1	5	2.95	1.27
Quick adaptation to external environmental changes	260	1	5	2.90	1.30
Balanced control with spontaneity	260	1	5	2.80	1.26
Lowering cultural gaps and other resistance and frictions	260	1	5	2.70	1.20
Valid N (list wise)	260				

It can be seen that Australian organisational environments equally value and promote creative SISP, knowledge sharing and cost saving. SISP is an innovative process (Huysman, Fisher and Heng, 1994) and the importance of knowledge sharing is acknowledged (Pai, 2006), thus having policies which support these trends helps the success of SISP. Also, good relationships between departments scored high. It is expected that if a company promotes friendly working relationships, cooperation can help more efficient data gathering for SISP and decrease the resistance to SISP implementation (Earl, 1993; Teo and Ang, 2001).

To check whether the influence of these policies on SISP success is real and not due to chance variation, a statistical correlation is performed and the results are shown in Table 6.68.

Table 6.68 Policies and SISP Success Relationships

	SISP Success					
	Very poor	Moderately poor	Neutral	Satisfactory	Very Good	Correlation coefficient
	Mean	Mean	Mean	Mean	Mean	Spearman's rho
Promoting new ideas and knowledge sharing	1.00	4.00	2.71	3.86	4.13	0.42*
Cost saving and reuse where appropriate	1.00	4.00	2.71	3.90	4.00	0.41*
Promoting cordial relationships between different departments	1.00	4.00	2.65	3.48	4.13	0.35*
Clear communications on all policies and responsibilities	1.00	4.00	2.52	3.59	3.88	0.39*
Innovative approach in solving customer problems	1.00	4.00	2.46	3.55	3.88	0.41*
Quick adaptation to external environmental changes	1.00	4.00	2.44	3.41	3.88	0.40*
Balanced control with spontaneity	1.00	3.00	2.42	3.28	3.63	0.38*
Lowering cultural gaps and other resistance and frictions	1.00	3.00	2.27	3.21	3.63	0.43*

* Correlation is significant at the 0.01 level (2-tailed).

All correlations are positive and statistically significant at the 0.01 level. Thus, validity of Policies as a predictor for SISP success is confirmed. The study also checks the influence of a political system and government policies (external policies) on SISP success. It can be seen from Table 6.69, that this relation exists and it is statistically significant at the 0.01 level. Even 41.4% of surveyed cases declared that external policies had an influence on SISP from which 42.5 % was positively related to SISP success.

Table 6.69 External Policies and SISP Success Relationships

	SISP Success						
	Very poor	Moderately poor	Neutral	Satisfactory	Very Good	Total	Correlation coefficient
	Mean	Mean	Mean	Mean	Mean	Mean	Spearman's rho
A political system and government policies	1	3	1.75	1.86	3.38	1.94	0.26*

* Correlation is significant at the 0.01 level (2-tailed).

Also, there is a positive and significant (at the 0.01 level) relationship between policies and the stages of SISP maturity. Table 6.70 shows that various policies have different importance for the different SISP maturity levels.

Table 6.70 Policies and SISP Maturity Relationships

	SISP Maturity Level			
	Attainable Planning	Sustainable Planning	Adaptable Planning	Correlation coefficient
	Mean	Mean	Mean	Spearman's rho
A political system and government policies	1.54	2.25	2.50	0.33*
Innovative approach in solving customer problems	2.13	3.59	4.00	0.55*
Promoting new ideas and knowledge sharing	2.28	3.98	4.00	0.57*
Quick adaptation to external environmental changes	2.00	3.52	4.75	0.65*
Promoting cordial relationships between different departments	2.33	3.59	4.25	0.46*
Lowering cultural gaps and other resistance and frictions	2.03	3.25	3.25	0.47*
Cost saving and reuse where appropriate	2.44	3.86	3.75	0.43*
Clear communications on all policies and responsibilities	2.18	3.57	4.75	0.56*
Balanced control with spontaneity	1.97	3.41	4.25	0.61*

* Correlation is significant at the 0.01 level (2-tailed).

Generally, the more the mature the SISP stage, the more pronounced the listed policies are. Only the mean value of 'Lowering cultural gaps and other resistance and frictions' is equal for the Sustainable and Adaptable planning levels. This probably indicates that at the Adaptable level of SISP planning, good relationships among SISP stakeholders and knowledge sharing, lessens the cultural gaps and other resistance to change. Simultaneously, as this awareness of the cultural gaps increases, SISP success increases. This relationship is shown in Table 6.68 and is statistically significant at the 0.01 level. This discussion confirms the hypothesis H7 defined as:

H7	As awareness towards cultural issues and other causes of resistance increases, SISP success increases.

A support for this hypothesis is also confirmed using SEM. All structural paths (Figure 6.22) are statistically significant and other fit statistics (Table 6.71) demonstrate that this 'partial' model fit the data very well. Additional statistical data are shown in Appendix G.

Table 6.71 SISP Policy and SISP Success Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Policy and Success	71.46	37	0.001	1.93	0.068	0.94	0.90	0.916	0.07	.960

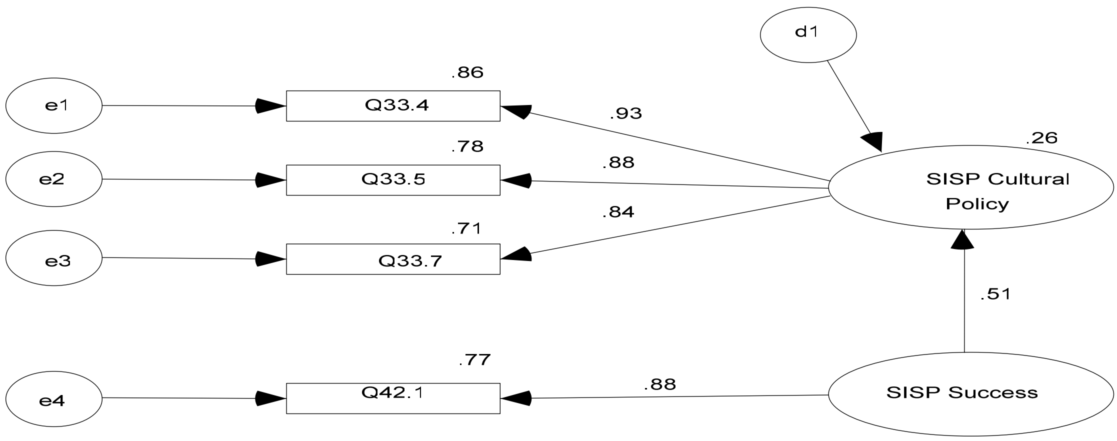


Figure 6.22 Policy on Cultural Gaps and SISP Success: Measurement and Structural Model

Also, the study investigates the relationship between internal policies and the size of a company. In addition, the importance of external policies for different sized companies is reported.

Table 6.72 Policies and Company Size Relationships

	Company Size			
	Small	Medium	Large	Correlation coefficient
	Mean	Mean	Mean	Spearman's rho
A political system and government polices	2.00	1.85	2.11	0.11 NC
Innovative approach in solving customer problems	3.00	2.67	3.50	0.22*
Promoting new ideas and knowledge sharing	2.80	2.94	3.82	0.28*
Quick adaptation to external environmental changes	2.80	2.56	3.57	0.32*
Promoting cordial relationships between different departments	2.60	2.87	3.50	0.18*
Lowering cultural gaps and other resistance and frictions	2.60	2.46	3.18	0.24*
Cost saving and reuse where appropriate	2.80	2.87	3.96	0.33*
Clear communications on all policies and responsibilities	2.80	2.65	3.71	0.34*
Balanced control with spontaneity	2.80	2.54	3.32	0.27*

* Correlation is significant at the 0.01 level (2-tailed).
* NC Non Significant correlation is significant.

These relationships are depicted in Table 6.72. The uderlying data shows that there is no statistically significant relationship between the political system and government policies and the size of an organisation. All other relationships are positive and statistically significant at the 0.01 level. This implies that large companies more readily promote and follow those policies.

6.8.1.3.1 Confirming Latent Factor 'Policy'

CFA (the scree plot in Figure 6.23) shows that this study does not reveal any subdimensions of the Policy construct. All the data loaded on a single factor.

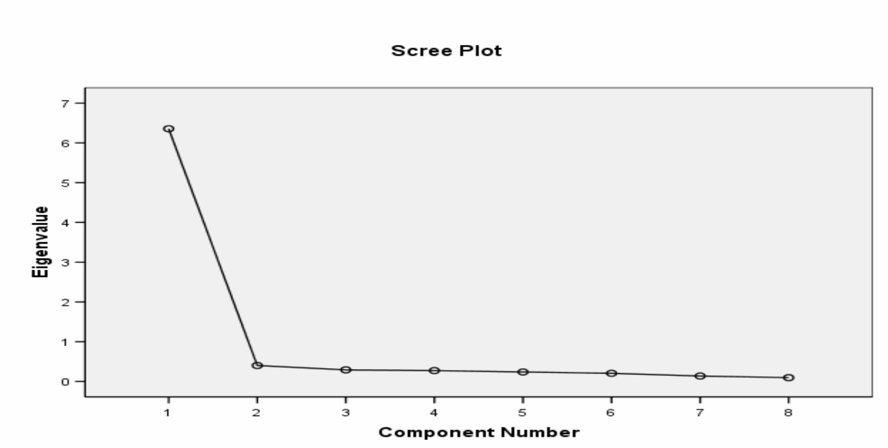


Figure 6.23 Scree Plot of CFA on Policy Construct of SISP Success

SEM statistics for a single latent factor showed that the measurement model fits the data exceptionally well (Table 6.73). Also, the factor loadings depicted in Figure 6.24 are confirmation that all items are strong predictors for the Policy construct.

Table 6.73 SISP Policy Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Policy	17.22	14	0.244	1.23	0.02	0.97	0.94	0.99	0.03	.998

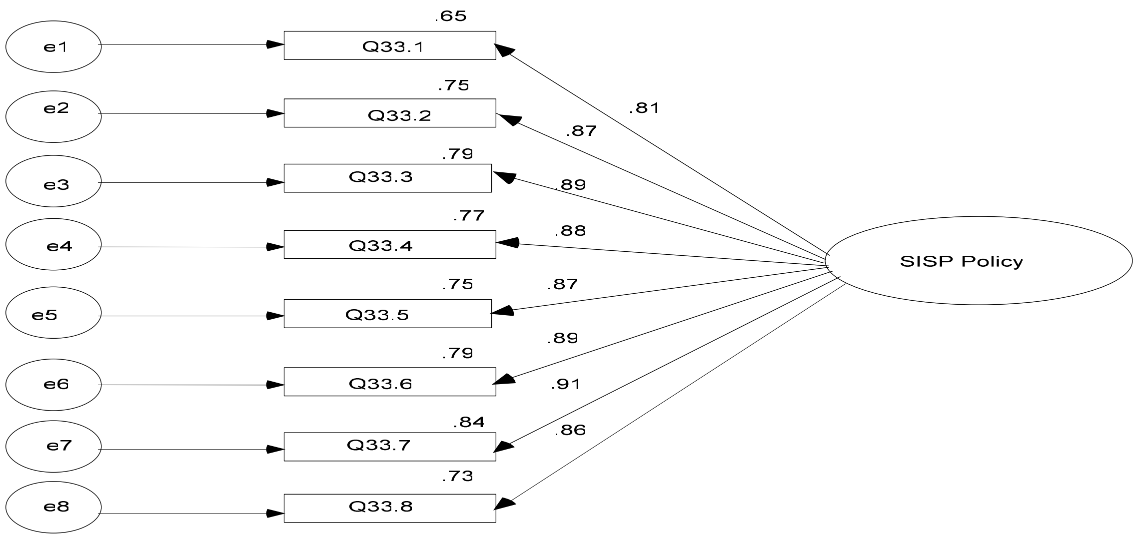


Figure 6.24 SISP Policy: Measurement Model

6.8.1.4 Knowledge Bank

The need for continuous improvement of knowledge for SISP planners and the need for knowledge sharing among SISP participants are reported in the SISP literature (Pervan, 1998; Pai 2006). Very few studies empirically investigate the influence of knowledge on effectiveness and efficiency of SISP. SISP effectiveness is improved by the quality which knowledge brings (knowing what to do) and efficiency is enhanced by the faster processing of SISP activities as a result of knowing ‘how to do’. This study statistically investigates that relationship through three subdimensions of this construct: (1) knowledge available relevant to SISP (all four types of knowledge identified by Pai, 2006, Chapter 4); (2) source of knowledge; (3) and knowledge sharing through learning reviews. In addition, the hypothesis H8 defined in Chapter 2 is tested, as well as relations between knowledge and SISP maturity and the size of an organisation. H8 is defined as:

H8	A more skilful SISP team produces more successful SISP.

Table 6.74 is organised in a way which clearly demonstrates that for all items of the scale, there is a monotonic increase in SISP success when the skills of the SISP team increase. All relationships are positive and statistically significant at the 0.01 level. Thus the null hypothesis cannot be accepted as H8 is supported by underlying data. The result of this test also confirmed that resources significantly influence the quality of SISP, thus emphasizing the need for allocation of adequate resources for planning (Premkumar and King, 1991).

Table 6.74 SISP Team Knowledge and SISP Success Relationships

		SISP Success Mean	**Total** Mean	**Std. Dev.**	**Correlation coefficient** Spearman's rho
The SISP team has adequate technical skills	Strongly Disagree	3.053	3.31	1.40	0.40*
	Disagree	3.8			
	Neither Agree or Disagree	3.143			
	Agree	3.5			
	Strongly Agree	4.071			
The SISP team has adequate project management skills	Strongly Disagree	3.048	3.17	1.44	0.37*
	Disagree	3.714			
	Neither Agree or Disagree	3.375			
	Agree	3.526			
	Strongly Agree	4			
The SISP team has adequate business skills	Strongly Disagree	3.053	3.18	1.38	0.32*
	Disagree	3.5			
	Neither Agree or Disagree	3.6			
	Agree	3.471			
	Strongly Agree	4			
The SISP team adopts an entrepreneurial marketing style	Strongly Disagree	3.24	2.43	1.18	0.29*
	Disagree	3.455			
	Neither Agree or Disagree	3.476			
	Agree	3.688			
	Strongly Agree	4.667			
The SISP team thinks strategically	Strongly Disagree	3	3.28	1.38	0.29*
	Disagree	3.4			
	Neither Agree or Disagree	3.571			
	Agree	3.657			
	Strongly Agree	3.6			
The SISP team has	Strongly Disagree	3	3.57	1.44	0.34*

		SISP Success Mean	Total Mean	Std. Dev.	Correlation coefficient Spearman's rho
knowledge about organisation objectives and goals	Disagree	4			
	Neither Agree or Disagree	3.4			
	Agree	3.538			
	Strongly Agree	3.75			

* Correlation is significant at the 0.01 level (2-tailed).

The H8 hypothesis is supported by SEM statistics too (Table 6.75). The excellent model fit confirmed the SISP Team Knowledge scale as shown in Figure 6.25. CFA proved the unidimensionality of the six-item scale. However, the SEM model-fitting process revealed a need for a model respecification by reducing the number of observed variables to five. Appendix G contains two additional tables which show CRs for the regression weights and residuals covariances.

Table 6.75 SISP Team Knowledge Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Team Knowledge	5.05	8	0.753	.631	0.01	0.99	0.97	0.99	0.00	1

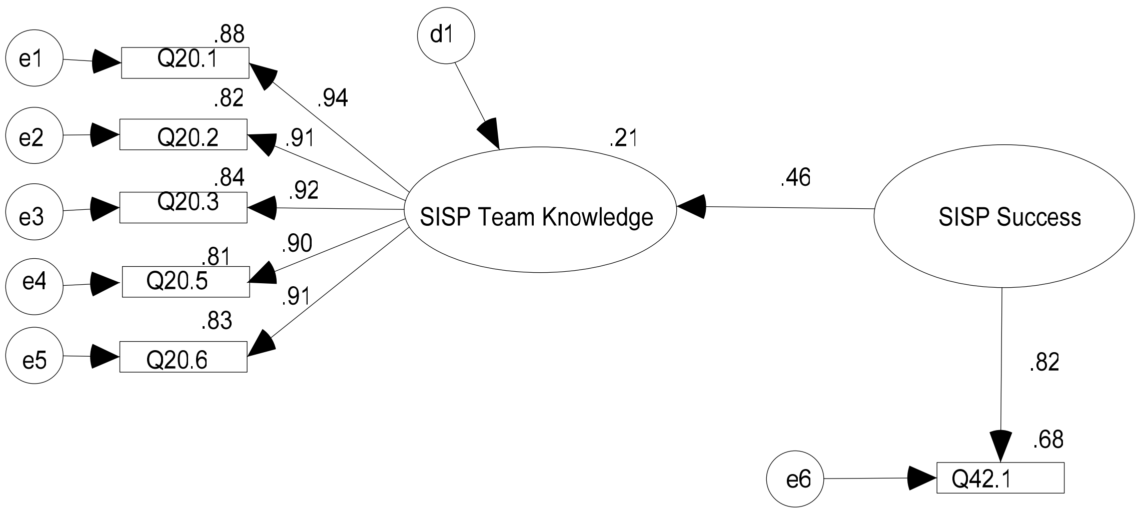


Figure 6.25 SISP Team Knowledge: Measurement and Structural Model

The mean values in Table 6.74 show that Australian organisations are not confident with their SISP team knowledge as on a scale 1 to 5, the mean value for the scale is 3.15 (min 2.43, max 3.57). This translates to an average of 55% of positive answers, where the SISP team knowledge about organisation objectives and goals score the highest 73% in positive answers.

Table 6.76 Learning Review and SISP Success Relationships

		SISP Success Mean	Correlation coefficient Spearman's rho	Total Mean	Std. Dev.
We capture and share the project's intellectual capital with all participants	Strongly Disagree	3.13	0.42*	2.68	1.43
	Disagree	3.56			
	Neither Agree or Disagree	3.27			
	Agree	3.80			
	Strongly Agree	4.13			
Learning of IS/IT impacts on customers behaviour is shared	Strongly Disagree	3.21	0.27*	2.66	1.49
	Disagree	3.75			
	Neither Agree or Disagree	3.64			
	Agree	3.46			
	Strongly Agree	4.11			
Learning of technology applications are shared	Strongly Disagree	3.13	0.34*	2.64	1.43
	Disagree	3.78			
	Neither Agree or Disagree	3.53			
	Agree	3.58			
	Strongly Agree	4.13			
Learning of SISP experience are shared	Strongly Disagree	3.16	0.34*	2.51	1.37
	Disagree	3.64			
	Neither Agree or Disagree	3.56			
	Agree	3.65			
	Strongly Agree	4.17			

* Correlation is significant at the 0.01 level (2-tailed).

A further analysis of the SISP knowledge source and SISP knowledge sharing revealed that the mean values of these scales are low, being 1.479 and 2.621 respectively (the source of expertise scale is a three point Likert scale and the learning review scale is a five point Likert scale). Only about 36% of the population positively answered the question on the learning review. This is probably one of the main reasons, for a low score on the knowledge. The influence of knowledge sharing on SISP success is confirmed (all correlations are positive and significant at the 0.01 level, Table 6.76). Therefore this study adds further validation to the work of Pai (2006), in which the study investigated the relationship between knowledge sharing and SISP in Taiwan.

Table 6.77 SISP Source of Expertise and SISP Success Relationships

		SISP Success Mean	Correlation coefficient Spearman's rho	Total Mean	Std. Dev.
Internal resources	Not used	3.00	0.35*	2.39	0.88
	To some degree used	3.86			
	Main source	3.63			
Software vendors	Not used	3.35	0.24*	1.38	0.51
	To some degree used	3.71			

		SISP Success Mean	Correlation coefficient Spearman's rho	Total Mean	Std. Dev.
	Main source	4.00			
Computer hardware vendors	Not used	3.36	0.23*	1.30	0.46
	To some degree used	3.77			
Books or periodicals	Not used	3.29	0.31*	1.43	0.54
	To some degree used	3.79			
	Main source	3.50			
Consultants	Not used	3.38	0.15**	1.61	0.70
	To some degree used	3.58			
	Main source	3.64			
Government and semi-government bodies	Not used	3.43	0.12 NC	1.21	0.43
	To some degree used	3.75			
	Main source	3.00			
University consultants	Not used	3.48	-0.03 NC	1.05	0.21
	To some degree used	3.50			

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Non significant correlation

Also, the influence of available skills on SISP success as well as the relevance of these skills for the SISP team expertise is investigated. It is found that skills as Programmer, Database administrator, IS/IT trainer, Technical support/systems programmer, and General IT consultant are not related to SISP success. To have an influence on SISP, the IS personnel needs to have, not only the technical skills but also an understanding of the strategic implications of the overall performance of IT. This is in accordance with the statement that 'SISP is too important to delegate to technicians', Lederer and Sethi (1999:216).

The result for the position 'General IT consultant' (Spearman's rho -0.1) is unexpected as the use of consultants is indicated in Table 6.77. Other results shown in Table 6.77 indicate that source of expertise from Government and semi-government bodies and University consultants are the least used by organisations. Similar results are shown in Teo et al. (1997), from which work the scale of the source of expertise is adopted. Teo et al. study showed that software and hardware vendors are the two most common sources of expertise in Singapore's companies (it is not clear whether that expertise was on top of internal resources). Australian companies mostly rely on their internal resources. Internal resources are the main source of expertise in 79.2% of cases, then Consultants with 15.3%. The software vendors are represented by 1.4% as the main source and they are to some degree used in 21.5% of cases.

Table 6.78 SISP Knowledge and SISP Maturity Level Relationships

	SISP Maturity Level			
	Attainable Planning	Sustainable Planning	Adaptable Planning	Correlation coefficient
	Mean	Mean	Mean	Spearman's rho
SISP team skills:				
The SISP team has adequate technical skills	2.38	3.98	5.00	0.61*
The SISP team has adequate project management skills	2.36	3.75	4.75	0.52*
The SISP team has adequate business skills	2.10	4.00	4.75	0.72*
The SISP team adopts an entrepreneurial marketing style	1.62	3.02	3.75	0.63*
The SISP team has strategical thinking	2.26	4.05	4.75	0.68*
The SISP team has knowledge about org objectives and goals	2.56	4.34	5.00	0.62*
Knowledge sharing				
Project's intellectual capital is captured and shared with all participants	1.67	3.43	4.25	0.65*
Learning of IS/IT impact on customers behaviour is shared	1.69	3.32	4.75	0.62*
Learning of technology applications is shared	1.74	3.25	4.75	0.60*
Learning of SISP experience is shared	1.67	3.05	4.75	0.60*
Source for the expertise:				
Internal resources	1.90	2.80	2.75	0.48*
Software vendors	1.21	1.52	1.50	0.30*
Computer hardware vendors	1.18	1.39	1.50	0.24*
Books or periodicals	1.21	1.61	1.50	0.35*
Consultants	1.36	1.77	2.25	0.37*
Government and semi-government bodies	1.15	1.23	1.50	0.13 NC
University consultants	1.08	1.00	1.25	-0.08 NC
Available skills:				
Business analyst	0.64	0.84	1.00	0.26*
Systems analyst	0.77	0.91	1.00	0.21*
Programmer	0.82	0.89	1.00	0.12 NC
Information systems planner	0.63	0.84	1.00	0.27*
Information analyst	0.55	0.84	1.00	0.34*
User support	0.95	0.98	1.00	0.09 NC
Technical support/systems programmer	0.85	0.86	1.00	0.06 NC
Project manager	0.78	0.91	1.00	0.20*

* Correlation is significant at the 0.01 level (2-tailed).
NC Non significant correlation

Table 6.78 demonstrates strong positive relationships between knowledge and knowledge sharing across all SISP maturity stages. Obviously, the importance of knowledge is more pronounced in the advanced SISP planning stages and as with SISP evolution, increased SISP quality and success is due to an accumulated knowledge bank in an organisation.

Table 6.79 SISP Knowledge and Company Size Relationships

	Company size			
	Small	**Medium**	**Large**	**Correlation coefficient**
	Mean	Mean	Mean	Spearman's rho
SISP team skills:				
The SISP team has adequate technical skills	2.60	3.00	4.04	0.35*
The SISP team has adequate project management skills	2.20	2.87	3.93	0.36*
The SISP team has adequate business skills	2.80	2.91	3.79	0.27*
The SISP team adopts an entrepreneurial marketing style	2.60	2.28	2.68	0.12 NC
The SISP team has strategical thinking	2.60	2.94	4.04	0.37*
The SISP team has knowledge about org objectives and goals	2.60	3.31	4.25	0.32*
Knowledge sharing				
Project's intellectual capital is captured and shared with all participants	2.80	2.37	3.25	0.24*
Learning of IS/IT impact on customers behaviour is shared	2.80	2.41	3.11	0.19*
Learning of technology applications is shared	2.80	2.43	3.04	0.16**
Learning of SISP experience is shared	2.60	2.31	2.86	0.15**
Source for the expertise				
Internal resources	1.80	2.26	2.75	0.31*
Software vendors	1.40	1.41	1.32	-0.07 NC
Computer hardware vendors	1.20	1.28	1.36	0.10 NC
Books or periodicals	1.40	1.33	1.61	0.24*
Consultants	1.60	1.65	1.54	-0.03 NC
Government and semi-government bodies	1.00	1.15	1.36	0.24*
University consultants	1.00	1.02	1.11	0.20*
Available skills:				
Business analyst	0.20	0.72	0.93	0.35*
Systems analyst	0.40	0.81	1.00	0.36*
Programmer	1.00	0.78	1.00	0.21*
Information systems planner	0.40	0.69	0.93	0.32*
Information analyst	0.40	0.64	0.93	0.34*
User support	0.80	0.98	0.96	0.07 NC
Technical support/systems programmer	0.60	0.85	0.93	0.18*
Project manager	0.60	0.82	0.96	0.25*

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Non significant correlation

The skills available and source of knowledge are partially correlated with the size of a company. The knowledge and knowledge sharing of SISP team seems to be related to the company size (Table 6.79 shows positive and statistically significant correlations at the 0.01 or 0.05 levels). SISP knowledge is very seldom empirically investigated and a survey of the SISP literature did not reveal a study with results comparable with this finding.

6.8.1.4.1 Confirming Latent Factor 'Knowledge Bank'

The CFA revealed four dimensions for the Knowledge Bank construct. They are shown in Figure 6.26 as: SISP team knowledge, Knowledge sharing, Source of expertise and

Available skills. The path analysis revealed that the most important dimension of the Knowledge Bank construct is the knowledge of the SISP team and then the source of expertise. In particular, internal resources are highly weighted. Table 6.80 contains the SEM statistical figures, which shows that the model depicted in Figure 6.26 fits the data very well (for clarity purposes, error covariances are not shown).

Table 6.80 SISP Knowledge Bank Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Knowledge Bank	175.21	98	0.000	.1.78	0.03	0.91	0.87	0.93	0.067	0.97

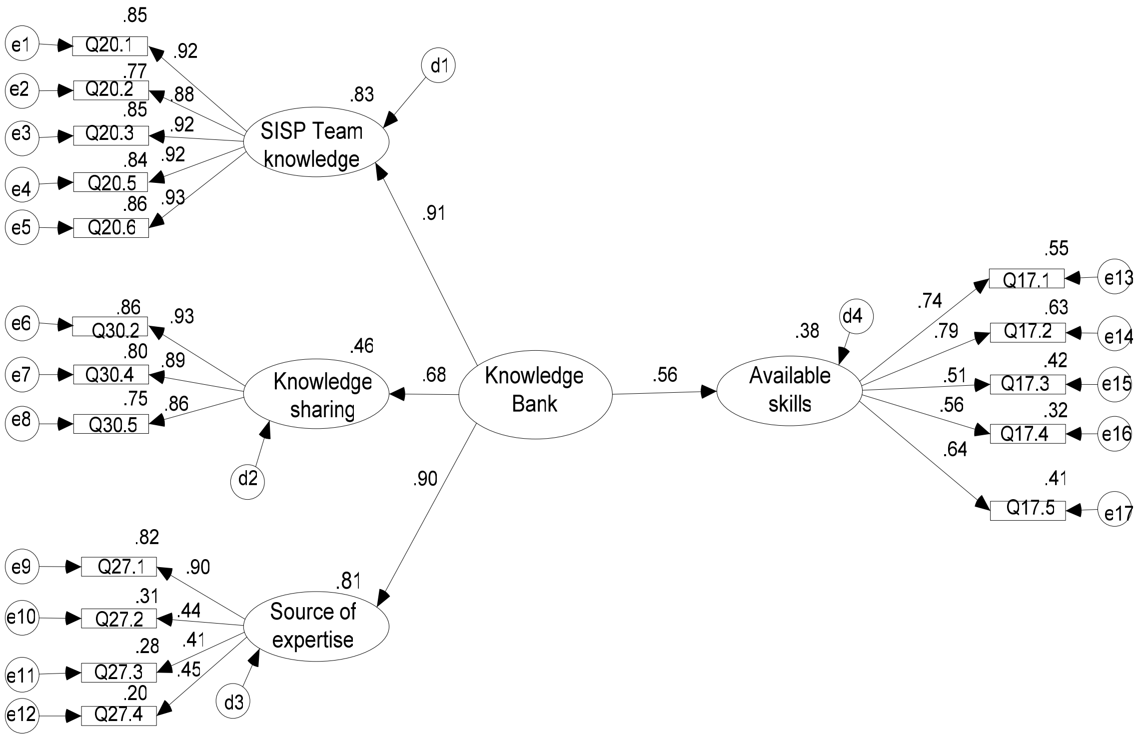


Figure 6.26 SISP Knowledge Bank: Measurement and Structural Model

6.8.2 Efficiency

The SISP efficiency is mainly assessed through its subdimensions, Stakeholders' Designation and Technology, defined in Chapters 2 and 4. Also, the analysis will try to find which methodologies are mostly commonly used and how successful they are. The relationships of these subdimensions with SISP success, SISP maturity levels and organisational size are investigated.

6.8.2.1 Stakeholders' Designation

The Stakeholders' Designation construct is assessed through the analysis of participation and commitment of the available SISP resources in the light of enhancing the efficiency of SISP. The previous sections confirmed that the lack of commitment from management is strongly related with SISP formation and implementation failures. On the other hand, too much commitment from management may impede SISP as it can promote excessive planning (Basu et al., 2002). Therefore, these conflicting results are worth investigation as they implicate that the efficiency of SISP is a complex phenomenon. The best approach is the assessment of the underlying relationships in the light of overall SISP success. Thus, the study will test this hypothesis.

H6	As senior management commitment towards SISP increases, SISP success increases.

Also, the participative SISP approach, (Ismail and Winder, 1996; Lederer and Mendelow 1989), may not be accepted in SISP practice. Ismail and Winder suggested many benefits of participative SISP, but also they pointed to potential obstacles to stakeholders' involvement, should they want to contribute. Many participants may add to the quality of SISP, but they can also slow down the planning process or have some other negative influence. Consequently, SISP participation will affect overall SISP success. This study investigates the current stakeholders' involvement in Australian SISP practice and tests the following hypothesis:

H5	If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful.

6.8.2.1.1 SISP Commitment

This study acknowledges that SISP, as a highly political process, has complex interrelations between stakeholders of which a detailed investigation is a study per se. The aim of this research is to assess the stakeholders' phenomena that are open to direct observation. Stakeholders' commitment is one of them. The results suggest (Table 6.81) that managerial commitment in Australian SISP practice is not so pronounced (the scale is from 0 to 3; the mean value is 1.72).

Table 6.81 Degree of Managerial Commitment towards SISP

	CEO	CIO	Senior Business Management	Middle Business Management	Only IS Management
No commitment	33.33%	31.03%	32.18%	42.53%	34.48%
Committed only at start	5.75%		6.90%	8.05%	4.60%
Committed at implementation phase	11.49%	3.45%	19.54%	26.44%	5.75%
Committed from start to finish	49.43%	65.52%	41.38%	21.84%	55.17%
Mean	1.77	2.03	1.70	1.32	1.82

About 35% of organizational management has no commitment towards SISP, about 6.3% is committed only at the start of the SISP process, and about 13.3% of management is committed only during the implementation phase. As an average, 46.7% of the managerial structure is committed from start to finish of the SISP process. The highest percentage is related to the commitment of CIOs. They are dedicated to SISP from start to finish in 65.52% of cases. Organisational commitment is manifested if adequate SISP resources are present (Premkumar and King, 1994). Data in Table 6.20 demonstrated that IT required skills are generally available at an average rate of 82%.

To test H6, data is provided in Table 6.82 (mean values), Table 6.83 (percentages) and graphically presented in Figure 6.27 and Figure 6.28. All correlations shown in Table 6.82 are statistically significant at the 0.01 level.

Table 6.82 Managerial Commitment toward SISP and SISP Success Relationships

	SISP Success		
CEO	Mean	Std. Deviation	Spearman's rho
No commitment	3.21	0.67	0.43*
Committed only at start	3.40	1.07	
Committed at implementation phase	3.70	0.47	
Committed from start to finish	3.63	0.72	
CIO	Mean	Std. Deviation	0.55*
No commitment	3.04	0.58	
Committed at implementation phase	3.67	0.52	
Committed from start to finish	3.68	0.71	
Senior business management	Mean	Std. Deviation	0.38*
No commitment	3.25	0.74	
Committed only at start	3.33	0.78	
Committed at implementation phase	3.88	0.69	
Committed from start to finish	3.50	0.65	
Middle business management	Mean	Std. Deviation	0.52*
No commitment	3.19	0.66	
Committed only at start	3.57	0.76	
Committed at implementation phase	3.57	0.65	
Committed from start to finish	3.90	0.71	
Only IS management	Mean	Std. Deviation	0.52*
No commitment	3.13	0.62	
Committed only at start	2.75	0.46	
Committed at implementation phase	3.80	0.42	
Committed from start to finish	3.73	0.70	

* Correlation is significant at the 0.01 level (2-tailed).

The analysis of the data shown in these tables supports the simple hypothesis that senior management commitment will increase the success of SISP. However, if organizational management is committed to SISP from start to finish, the success of SISP may not be greater than if their commitment is only at the implementation of SISP (Table 6.82, Figure 6.28) if to judge by the mean values. Nevertheless, percentages for satisfactory and very good columns for the success of SISP in Table 6.83 are higher if management is committed from start to finish than in any other case.

Table 6.83 Managerial Commitment toward SISP and SISP Success Relationships (Percentage)

		SISP Success				
		Very poor	**Moderately poor**	**Neutral**	**Satisfactory**	**Very Good**
CEO	No commitment	100%		43.76%	20.70%	12.50%
CIO	No commitment	100%		50.01%	3.45%	12.50%
Senior business management	No commitment	100%		41.67%	17.25%	25.00%
Middle business management	No commitment	100%		60.41%	17.25%	25.00%
Only IS management	No commitment	100%		50.01%	13.80%	12.50%
CEO	Committed only at start	.	100%	4.17%	3.45%	12.50%
Senior business management	Committed only at start	.	100%	4.17%	10.35%	0.00%
Middle business management	Committed only at start	.	100%	2.08%	17.25%	0.00%
Only IS management	Committed only at start	.	100%	6.25%	0.00%	0.00%
CEO	Committed at implementation phase	.		6.25%	24.15%	0.00%
CIO	Committed at implementation phase	.		2.08%	6.90%	0.00%
Senior business management	Committed at implementation phase	.		10.42%	31.02%	37.50%
Middle business management	Committed at implementation phase	.		25.00%	31.02%	25.00%
Only IS management	Committed at implementation phase	.		2.08%	13.80%	0.00%
CEO	Committed from start to finish	.		45.84%	51.73%	75.00%
CIO	Committed from start to finish	.	100%	47.92%	89.68%	87.50%
Senior business management	Committed from start to finish	.		43.76%	41.37%	37.50%
Middle business management	Committed from start to finish	.		12.51%	34.47%	50.00%
Only IS management	Committed from start to finish	.		41.67%	72.43%	87.50%

Note: Relative Percentage (calculated as percentage of 100% for each success level)

Figure 6.28 also shows that management commitment is more important in the implementation phase than at the start of the SISP process. This finding is not in agreement with finding that the processes of planning and the implementation of plans are equally important for SISP success (Earl, 1993), thus management commitment at the start and at the implementation phases should equally contribute to SISP success. Gottschalk (1999) found a relatively lack of importance of management support for the implementation of SISP, which is quite the opposite of the findings in this study. This study can offer several explanations for the present results. Firstly, there is no guarantee that a good plan will be adequately translated into action plans (Hartono et al., 2003; Teo and Ang, 2001). Furthermore, high SISP failure rates and the promoted importance of SISP success may influence greater support from management during implementation to ensure the success of SISP. Finally, only implemented SISP can be (more or less) successful, but non-implemented SISP (regardless of its quality) is 100% failure. Thus the result obtained in this study is reasonable.

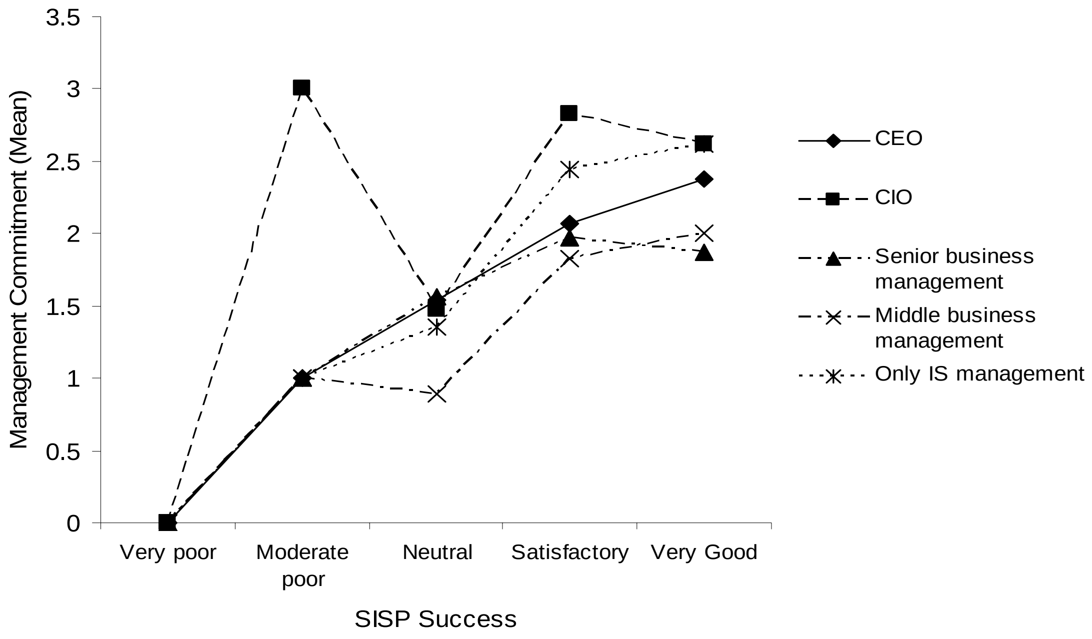


Figure 6.27 Managerial Commitment and SISP Success Relationships (categorical)

Basu et al. (2002:516) found support for the following hypothesis: 'As organisational commitment increases, SISP success increases until it (success) reaches a maximum; as organisational commitment continues to increase, SISP success decreases'. This study tests a 'similar' hypothesis; instead of organisational commitment, senior management commitment is tested. Senior management commitment is a subset of organisational commitment, thus this substitution should not affect the hypothesis. Furthermore, most of the SISP issues are related to top management commitment, which adds weight to the definition of the hypothesis as follows:

H6 a	As senior management commitment increases, SISP success increases until it (success) reaches a maximum; as senior management commitment continues to increase, SISP success decreases.

Testing of H6a involves careful analysis of the data presented in Table 6.83. To easily interpret the data, graphical plots are depicted in Figure 6.29. A graph presenting CIOs commitments, and a graph presenting senior business management commitment, support H6a. (Note that all correlations are confirmed by a nonparametric correlation test. Coefficients are shown in Table 6.82).

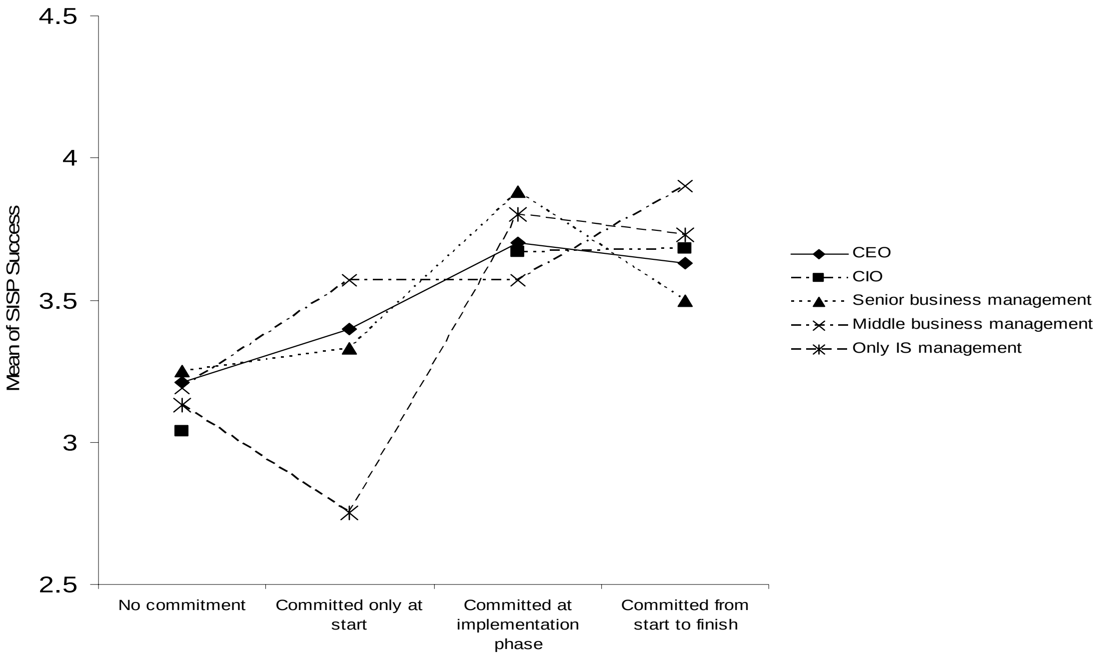


Figure 6.28 SISP Success and Managerial Commitment Relationships (categorical)

In actual practice, commitments from different power actors are manifested differently on the success of SISP. Strong devotion from the CIO impedes SISP possibly on the grounds of insisting on 'too much planning' (Basu et al., 2002) which can have a negative influence on the success of SISP. Empirical data show that commitment of CEOs to SISP is of a different nature and is always positively related to SISP. A similar result is obtained for middle business management. Thus, H6a is partially supported in this study.

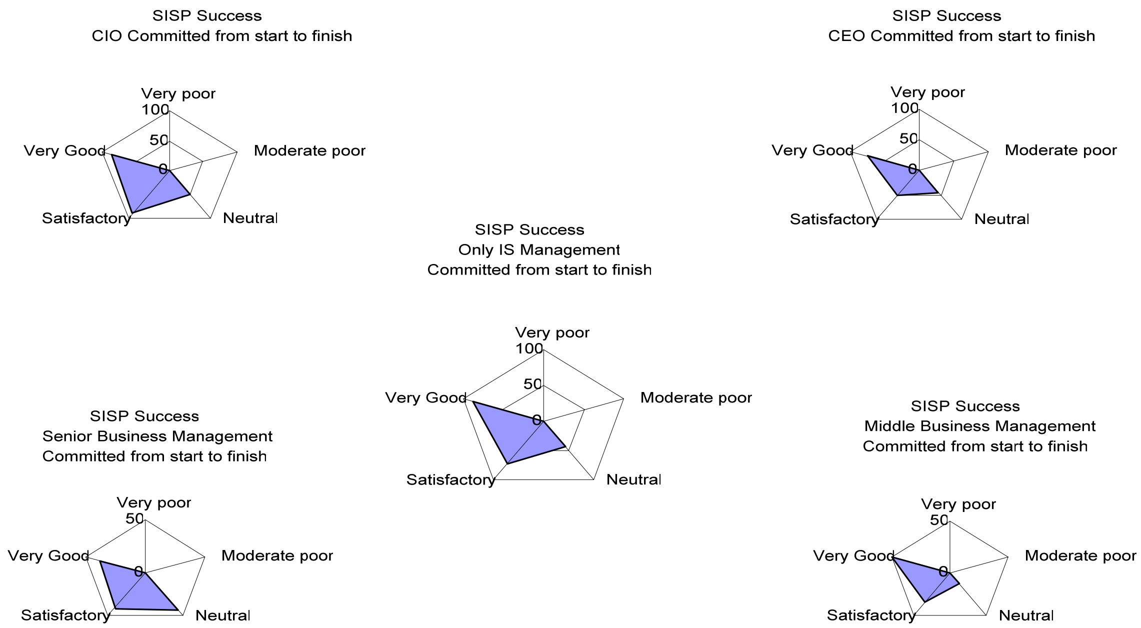


Figure 6.29 Managerial Commitment (from start to finish) and SISP Success Relationships

It can be seen from Table 6.84 that top management commitment increases as the maturity of SISP increases. However, the highest level of SISP maturity indicates that commitment of IS management at that level starts to decrease. This is a very important finding, as it confirms the theoretical expectations that mature SISP should be less dependent on management commitment. Clear delegation of responsibility, knowledge sharing and experience of all involved in the SISP process make SISP a reasonable process (no overplanning).

Table 6.84 Managerial Commitment and SISP Maturity Levels Relationships (Means)

	CEO	CIO	Senior business management	Middle business management	Only IS management
Attainable Planning	0.97	1.28	0.87	0.46	1.03
Sustainable Planning	2.36	2.61	2.32	1.89	2.50
Adaptable Planning	3.00	3.00	3.00	3.00	2.00
Spearman's rho	0.53*	0.48*	0.58*	0.65*	0.47*

* Correlation is significant at the 0.01 level (2-tailed).

Similarly, managerial commitment increases as the size of the company increases (Table 6.85). All relations are statistically significant at the 0.01 level except for CEOs. This is possibly because this designation does not commonly exist in small and medium organisations. There is no similar study to compare this result as the SISP literature mainly investigates the SISP phenomenon in large companies. A few studies which examined SISP in small companies did not investigate this type relationship.

Table 6.85 Managerial Commitment and Company size Relationships (Means)

		CEO	CIO	Senior business management	Middle business management	Only IS management
Small	Mean	1.60	0.40	0.60	0.00	0.60
Medium		1.67	1.74	1.63	1.19	1.63
Large		2.00	2.89	2.04	1.75	2.39
	Spearman's rho	0.12	0.50*	0.23*	0.32*	0.31*

* Correlation is significant at the 0.01 level (2-tailed).

6.8.2.1.2 SISP Participation

SISP participants can be broadly characterised as managerial, IT non-managerial and other stakeholders like vendors and users. Participants are differentiated by the roles they have in the SISP process. For example, managerial members involved in SISP can have different roles, but top executives are supposed to have a champion role (Basu et al., 2002). The other roles are identified as supporting, sponsorship and active leadership. Table 6.86 shows that the highest SISP participants are CIOs and IS managers, which is widely supported in the SISP literature (Teo et al., 1997).

Table 6.86 SISP Participants: Descriptive Statistic

SISP Participants	Mean	Std. Deviation
CIO	3.14	1.49
IS management	2.95	1.32
Senior business management	2.44	1.19
CEO	2.14	1.25
Middle business management*	1.97	1.09
Other stakeholders	1.70	0.91
Users	1.64	0.74
Systems analysts (developers)	1.64	0.77
Consultant	1.56	0.84
Vendors*	1.54	0.73
Computer operations personnel	1.40	0.67
Computer systems programmer	1.38	0.61

* Items dropped from the scale because of factor crossloading

Figure 6.30 shows radar graphs for the highest ranked SISP participants. From this figure it can be seen that active leadership and champion roles are the most pronounced roles for CIOs, other IS managers mostly have active leadership roles and senior business managers have supporting roles most of the time.

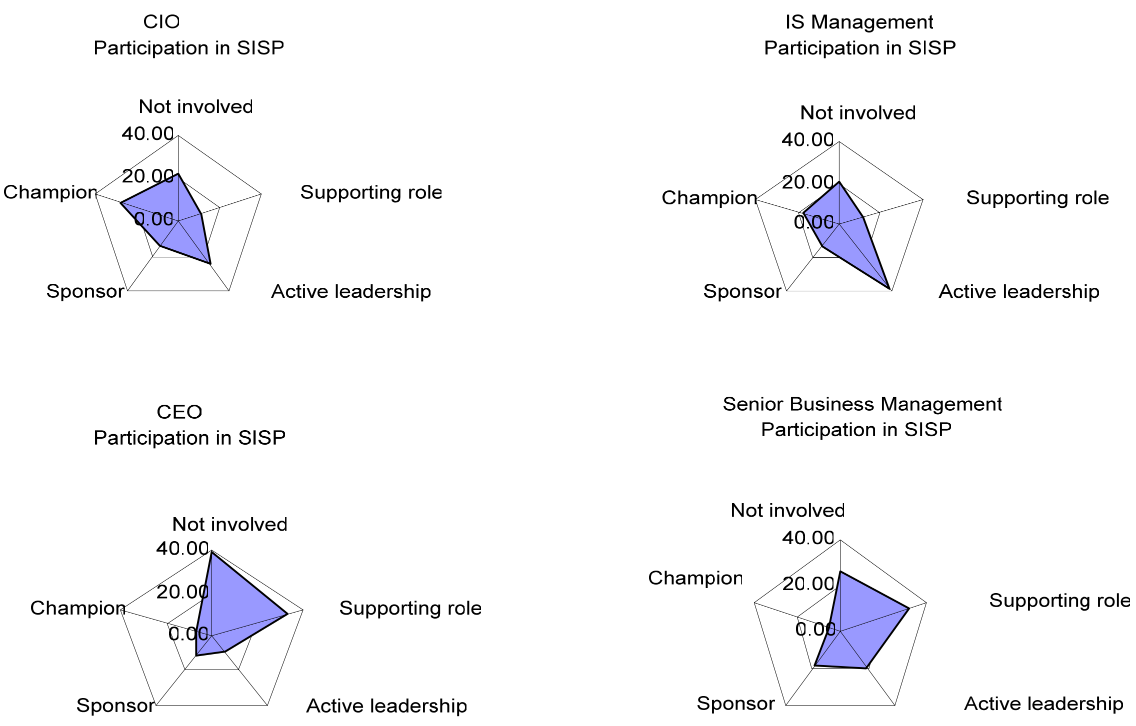


Figure 6.30 Main SISP Participants and their Roles

The relationship between top management involvement and SISP success is widely investigated and it is generally reported that greater involvement will lead to greater SISP success. Basu et al. (2002) did not find an 'inverted-U' relationship between senior management participation and SISP success as in the case of organisational commitment. As wide SISP participation is recently advocated (Ismail and Winder, 1996), this study also investigates the contribution of other SISP stakeholders to SISP in the Australian environment.

Table 6.87 presents the relationships between SISP stakeholders and SISP success. It can be seen that the underlying data does not support the influence of IT personnel as systems analysts, developers, programmers and other computer operations personnel on SISP success. Consultants and users also do not influence SISP success. This finding is in contradiction with the findings who suggested the involvement of users in SISP (Palanisamy, 2005). On the other hand, computer experts should not handle SISP (Lederer and Sethi, 1999). However, SISP maturity is significantly related with all participants, indicating a call form theory for greater participation in SISP.

Table 6.87 SISP Participation and SISP Success Relationships

		SISP Success						SISP Maturity
		Very poor (%)	**Moderately poor (%)**	**Neutral (%)**	**Satisfactory (%)**	**Very Good (%)**	**Spear. rho**	**Spear. rho**
CEO	Not involved	100	0.00	43.75	34.48	25.00	0.18*	0.46*
	Supporting role	0	0.00	35.42	34.48	25.00		
	Active leadership	0	100.00	10.42	6.90	0.00		
	Sponsor	0	0.00	4.17	20.69	25.00		
	Champion	0	0.00	6.25	3.45	25.00		
CIO	Not involved	100	0.00	37.50	0.00	0.00	0.32*	0.52**
	Supporting role	0	0.00	8.33	17.24	12.5		
	Active leadership	0	100.00	16.67	41.38	12.5		
	Sponsor	0	0.00	14.58	10.34	25		
	Champion	0	0.00	22.92	31.03	50		
IS management	Not involved	0	0.00	37.50	0.00	0.00	0.19*	0.33*
	Supporting role	0	0.00	4.17	24.14	0.00		
	Active leadership	0	0.00	33.33	51.72	37.50		
	Sponsor	0	0.00	8.33	17.24	25.00		
	Champion	100	100.00	16.67	6.90	37.50		
Senior business management	Not involved	100.00	0.00	41.67	6.90	0.00	0.35*	0.50*
	Supporting role	0.00	0.00	27.08	37.93	37.50		
	Active leadership	0.00	0.00	16.67	24.14	25.00		
	Sponsor	0.00	100.00	12.50	20.69	37.50		
	Champion	0.00	0.00	2.08	10.34	0.00		
Middle business management	Not involved	100.00	0.00	47.92	34.48	0.00	0.27*	0.40*
	Supporting role	0.00	100.00	37.50	48.28	50.00		
	Active leadership	0.00	0.00	4.17	6.90	12.50		
	Sponsor	0.00	0.00	8.33	0.00	37.50		

		SISP Success						SISP Maturity
		Very poor (%)	**Moderately poor (%)**	**Neutral (%)**	**Satisfactory (%)**	**Very Good (%)**	**Spear. rho**	**Spear. rho**
	Champion	0.00	0.00	2.08	10.34	0.00		
Systems analysts (developers)	Not involved	0.00	100.00	58.33	48.28	12.50	0.14NC	0.38*
	Supporting role	0.00	0.00	29.17	48.28	62.50		
	Active leadership	0.00	0.00	8.33	3.45	25.00		
	Sponsor	100.00	0.00	4.17	0.00	0.00		
Computer systems programmer	Not involved	100.00	100.00	68.75	68.97	50.00	0.08NC	0.34*
	Supporting role	0.00	0.00	25.00	27.59	50.00		
	Active leadership	0.00	0.00	4.17	3.45	0.00		
	Sponsor	0.00	0.00	2.08	0.00	0.00		
Computer operations personnel	Not involved	0.00	0.00	70.83	72.41	50.00	-0.04NC	0.24
	Supporting role	0.00	100.00	20.83	27.59	50.00		
	Active leadership	0.00	0.00	6.25	0.00	0.00		
	Sponsor	100.00	0.00	2.08	0.00	0.00		
Users	Not involved	100.00	0.00	56.25	34.48	37.50	0.13NC	0.49*
	Supporting role	0.00	100.00	35.42	62.07	37.50		
	Active leadership	0.00	0.00	4.17	3.45	25.00		
	Sponsor	0.00	0.00	2.08	0.00	0.00		
	Champion	0.00	0.00	2.08	0.00	0.00		
Consultant	Not involved	100.00	0.00	68.75	62.07	37.50	0.08NC	0.44*
	Supporting role	0.00	100.00	12.50	27.59	37.50		
	Active leadership	0.00	0.00	14.58	6.90	25.00		
	Sponsor	0.00	0.00	4.17	3.45	0.00		
Other Stakeholders	Not involved	100.00	0.00	62.50	37.93	25.00	0.18**	0.53*
	Supporting role	0.00	100.00	25.00	51.72	50.00		
	Active leadership	0.00	0.00	6.25	6.90	12.50		
	Sponsor	0.00	0.00	4.17	0.00	12.50		
	Champion	0.00	0.00	2.08	3.45	0.00		

Note: Relative Percentage (calculated as a percentage is out of 100% for each success level)
* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (1-tailed).
NC non significant correlation

Still other stakeholders not explicitly targeted by this study could be influencing SISP success. This is supported by statistically significant correlations of 'other stakeholders' with SISP success. Figure 6.31 shows that the supporting role of 'other stakeholders' is positively associated with SISP success. Finding that SISP participants are mainly from senior management does not diminish the findings of Ismail and Winder (1996) it simply could mean that wider SISP participation needs to be promoted in Australia.

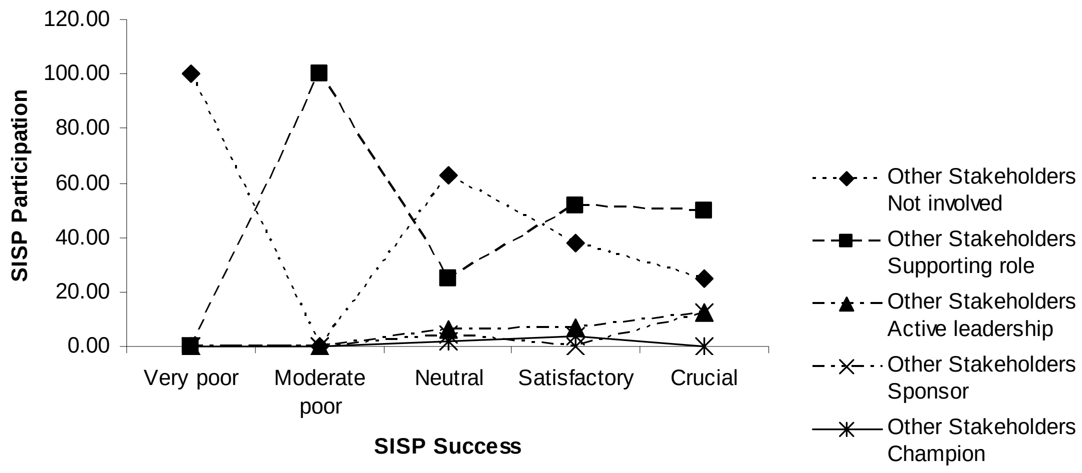


Figure 6.31 Other Stakeholders Participation and SISP Success Relationships

An analysis of Table 6.87 shows that if top management has the champion role, then SISP success is almost guaranteed. The exception is IS management, as when the champion is elected from IS management SISP may not be so successful. Otherwise, as shown in Figure 6.32, as management involvement increases, SISP success increases, without reaching a limit. Thus this study confirms the finding of Basu et al. (2002) that senior management involvement does not predict SISP success with an 'inverted-U' shape relationship.

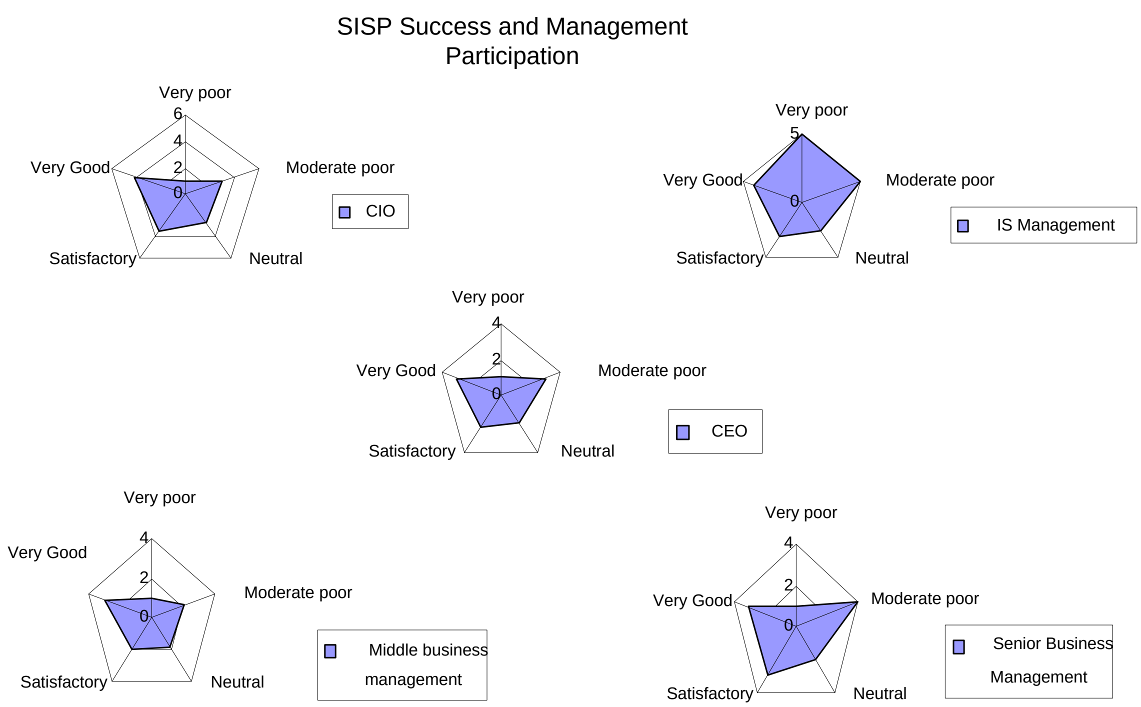


Figure 6.32 Relationships: SISP Success and Management Participation

It is important to know whether SISP participation depends of the size of a company. Full statistics of all SISP participants and their roles are shown in Table 6.88.

Table 6.88 Participation in SISP versus Company Size

		Small (<$10 M) **5.7%**	**Medium** ($10 to$ 500)M **62.1%**	**Large** (>$500M) **32.2%**	**Total**	**Spearman's rho**
CEO	Not involved	2.3%	25.3%	11.5%	39.1%	0.06 NC
	Supporting role	2.3%	20.7%	10.3%	33.3%	
	Active leadership		5.7%	3.4%	9.2%	
	Sponsor		6.9%	4.6%	11.5%	
	Champion	1.1%	3.4%	2.3%	6.9%	
CIO	Not involved	3.4%	17.2%	1.1%	21.8%	0.26*
	Supporting role	1.1%	6.9%	3.4%	11.5%	
	Active leadership	1.1%	13.8%	10.3%	25.3%	
	Sponsor		4.6%	9.2%	13.8%	
	Champion		19.5%	8.0%	27.6%	
IS management	Not involved	3.4%	16.1%	1.1%	20.7%	0.27*
	Supporting role		6.9%	3.4%	10.3%	
	Active leadership	2.3%	21.8%	14.9%	39.1%	
	Sponsor		5.7%	6.9%	12.6%	
	Champion		11.5%	5.7%	17.2%	
Senior business management	Not involved	3.4%	18.4%	4.6%	26.4%	0.22*
	Supporting role		19.5%	11.5%	31.0%	
	Active leadership	2.3%	12.6%	4.6%	19.5%	
	Sponsor		9.2%	9.2%	18.4%	
	Champion		2.3%	2.3%	4.6%	
Middle business management	Not involved	3.4%	23.0%	12.6%	39.1%	0.08 NC
	Supporting role	1.1%	31.0%	10.3%	42.5%	
	Active leadership		2.3%	3.4%	5.7%	
	Sponsor	1.1%	2.3%	4.6%	8.0%	
	Champion		3.4%	1.1%	4.6%	
Users	Not involved	3.4%	35.6%	8.0%	47.1%	0.29*
	Supporting role	1.1%	24.1%	19.5%	44.8%	
	Active leadership	1.1%	1.1%	3.4%	5.7%	
	Sponsor			1.1%	1.1%	
	Champion		1.1%		1.1%	
Systems analysts (developers)	Not involved	3.4%	32.2%	14.9%	50.6%	0.06 NC
	Supporting role	1.1%	24.1%	12.6%	37.9%	
	Active leadership		3.4%	4.6%	8.0%	
	Sponsor	1.1%	2.3%		3.4%	
	Champion					
Computer systems programmer	Not involved	4.6%	42.5%	20.7%	67.8%	0.05 NC
	Supporting role		17.2%	10.3%	27.6%	
	Active leadership		2.3%	1.1%	3.4%	
	Sponsor	1.1%			1.1%	
	Champion					
Computer operations personnel	Not involved	4.6%	41.4%	21.8%	67.8%	0.00 NC
	Supporting role		17.2%	9.2%	26.4%	
	Active leadership	1.1%	1.1%	1.1%	3.4%	
	Sponsor		2.3%		2.3%	
	Champion					
Vendors	Not involved	5.7%	35.6%	17.2%	58.6%	0.15 NC
	Supporting role		20.7%	9.2%	29.9%	

		Small (<$10 M) **5.7%**	Medium ($10 to$ 500)M **62.1%**	Large (>$500M) **32.2%**	Total	Spearman's rho
	Active leadership		4.6%	5.7%	10.3%	
	Sponsor		1.1%		1.1%	
	Champion					
Consultant	Not involved	4.6%	39.1%	19.5%	63.2%	0.04 NC
	Supporting role		13.8%	6.9%	20.7%	
	Active leadership		6.9%	5.7%	12.6%	
	Sponsor	1.1%	2.3%		3.4%	
	Champion					
Stakeholders	Not involved	4.6%	39.1%	6.9%	50.6%	0.39*
	Supporting role	1.1%	17.2%	18.4%	36.8%	
	Active leadership		2.3%	4.6%	6.9%	
	Sponsor		1.1%	2.3%	3.4%	
	Champion		2.3%		2.3%	

* Correlation is significant at the 0.01 level (2-tailed).
NC Correlation is not significant.

In Table 6.89, the means and correlation coefficients are shown. For all statistically significant categories (management participation, users and stakeholders), it is evident that their participation in SISP increases as company size increases.

This is an important finding of this study. Large organisations are more associated with SISP success in comparison with small or medium sized companies. As SISP success is influenced by participation, small and medium sized companies should promote more participative SISP.

Table 6.89 SISP Participation and Company size Relationships (Means)

SISP Participants	Small	Medium	Large	Spearman's rho
CEO	2.20	2.07	2.25	0.06 NC
CIO	1.60	3.04	3.61	0.26*
IS management	1.80	2.83	3.39	0.27*
Senior business management	1.80	2.31	2.79	0.22*
Middle business management	1.80	1.91	2.11	0.08 NC
Users	1.60	1.50	1.93	0.29*
Systems analysts (developers)	1.80	1.61	1.68	0.06 NC
Computer systems programmer	1.60	1.35	1.39	0.05 NC
Computer operations personnel	1.40	1.43	1.36	0.00 NC
Vendors	1.00	1.54	1.64	0.15 NC
Consultant	1.60	1.56	1.57	0.04 NC
Other Stakeholders	1.20	1.56	2.07	0.39*

* Correlation is significant at the 0.01 level (2-tailed).
NC non significant correlation.
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The SISP literature supports the view that if SISP is initiated by top management and IS management coalition, it would significantly add value to the SISP process (Spremic and Strugar, 2002). Also, when top management rather than MIS management initiates the SISP study, more environmental assessment is done (Chi et al., 2005). Spremic and Strugar found that the main initiators of SISP in Croatian organisations is IS management (33%) and top management (27.5%). They relate the high rate of SISP failure to the lack of line management initiating SISP. Flynn and Goleniewska (1993) found that more often SISP was initiated by the IT department than management (22% against 55%, note: very small sample size of 18 companies), while Teo et al. (1997) reported 8.6% for top management and 41.4% for IS management.

This study finds that top management (CIO, CEO) initiates SISP in 41.81% of cases. Senior business management more often initiated SISP than IS management (Table 6.90) and in their coalition, SISP was initiated only in 8.47% cases. The result that senior business management more often initiated SISP than IS management is not consistent with the earlier findings of similar studies. IS management is expected to play a leading role in SISP, as confirmed by the survey results of Teo et al. (1997). Perhaps, a high percentage of SISP initiation by CIOs' is a compensation for the somewhat lower than expected percentage of SISP initiation by IS management.

Table 6.90 SISP Initiators: Descriptive Statistics

Rank	SISP Initiators	Mean	Std. Deviation	Total Percentage
1	CIO	0.57	0.50	28.25%
2	Senior business management	0.37	0.48	18.08%
3	IS management	0.32	0.47	15.82%
4	CEO	0.28	0.45	13.56%
5	Senior business and IS management together	0.17	0.38	8.47%
6	IS staff planners	0.07	0.25	3.39%
7	Middle management	0.06	0.23	2.82%
8	Users and IS management together	0.06	0.23	2.82%
9	IS and middle management together	0.05	0.21	2.26%
10	Senior business, IS, and middle management coalition	0.05	0.21	2.26%
11	Users, business management and IS management coalition	0.05	0.21	2.26%

This research fails to support hypothesis H5 i.e. SISP is more successful if it is initiated by a senior business manager and an IS management coalition. The correlation Table 6.91 shows positive and significant relationships (shown in bold) only between top management as initiators and SISP success. However, SISP maturity correlations support coalition of management and user as initiators.

Table 6.91 SISP Initiators, SISP Success and SISP Maturity Relations

SISP Initiators	SISP Success		SISP Maturity Level	
	Spearman's rho	Sig. (2-tailed)	Spearman's rho	Sig. (2-tailed)
CEO	**0.22**	0.00	**0.47**	0.00
CIO	**0.28**	0.00	**0.54**	0.00
Senior business management	0.09	0.22	**0.34**	0.00
IS management	0.10	0.18	0.11	0.15
Middle management	-0.11	0.16	0.01	0.90
IS and middle management together	0.11	0.14	**0.17**	0.02
Senior business and IS management together	0.11	0.14	**0.31**	0.00
IS staff planners	0.06	0.44	-0.04	0.60
Senior business, IS, and middle management coalition	-0.08	0.31	0.07	0.36
Users and IS management together	0.06	0.42	0.10	0.18
Users, business management and IS management coalition	0.02	0.82	**0.17**	0.02

The influence of top management as SISP initiators on the success of SISP is shown in Figure 6.33. It can be seen that if SISP is initiated by CIOs, it will be more successful. The actual data support the fact that SISP success can as much as doubled if it is initiated by CIOs rather than CEOs.

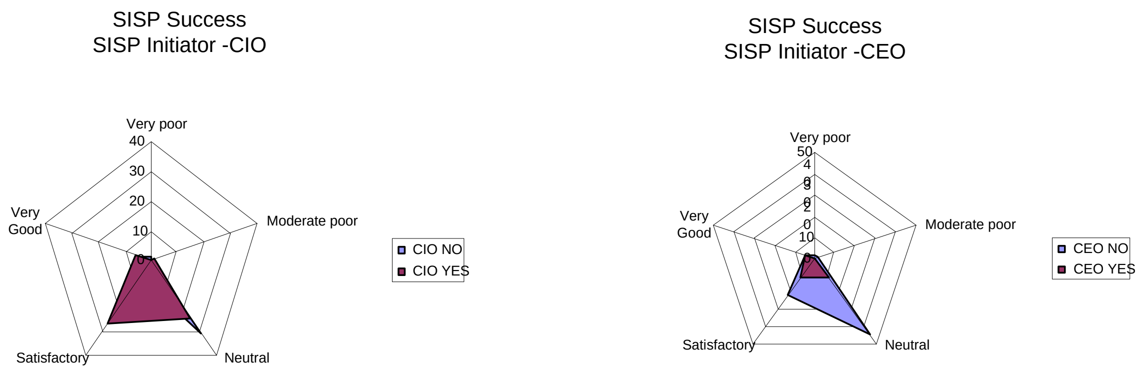

Figure 6.33 SISP Success and Top Management as SISP Initiators

Similar results are obtained when the population was tested for the reasons of SISP initiation (Table 6.92). Senior business management has the highest influence on the need to start SISP. A large percentage (56.3%) of organizations performs SISP as a continuous activity. Still a significant percentage (39%) of SISP activities is triggered by executive change. SISP as a continuous process has the highest association with SISP success, SISP maturity level and the size of an organization (Spearman's rho correlation coefficients of 0.39, 0.58, 0.26, respectively, all significant at the 0.01 level).

Table 6.92 The reasons for SISP Initiation: Descriptive Statistics

	Mean	Std. Dev.	Important influence	Critical influence
Senior business management	2.11	1.18	24.1%	17.2%
SISP planning/review is continuous process	2.09	1.10	27.6%	12.6%
IT executive change	2.03	1.18	19.5%	17.2%
Competitive pressure	1.87	1.17	17.2%	14.9%
Need to change production or production economics	1.82	1.13	11.5%	13.8%
IT repositioning in the firm	1.77	1.08	14.9%	10.3%
IT consolidation	1.72	1.02	17.2%	8.0%
IT reorganization	1.72	1.04	12.6%	10.3%
IT repositioning in industry or society	1.67	1.08	5.7%	12.6%

6.8.2.1.3 Confirming Latent Factor 'Stakeholder's Designation'

The Stakeholder's Designation construct is operationalised by four latent factors (Figure 6.34). The CFA demonstrates that the original segregation between SISP participation and commitment is not fully supported. There is some overlapping between those two factors. Generally, management participation is considered as a commitment to SISP; while for stakeholders, such as users, vendors, consultants, etc., participation is distinguished from commitment. This makes sense, as for example, the participation of users cannot be taken as their commitment to SISP. It is important to point out that CEOs' contribution to SISP emerged as a latent factor on its own, indicating the importance of CEO involvement in SISP. The structural path analysis confirms that the most important factor to SISP is the commitment of organizational management and the least important factor is who the SISP initiator is. Using SEM, the goodness-of-fit statistics shown in Table 6.93 confirm that this model fits the data well. (Note: error covariances are not shown).

Table 6.93 SISP Stakeholder's Designation Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP – Stakeholder's Designation	100.64	52	0.000	.1.93	0.04	0.93	0.87	0.91	0.07	0.95

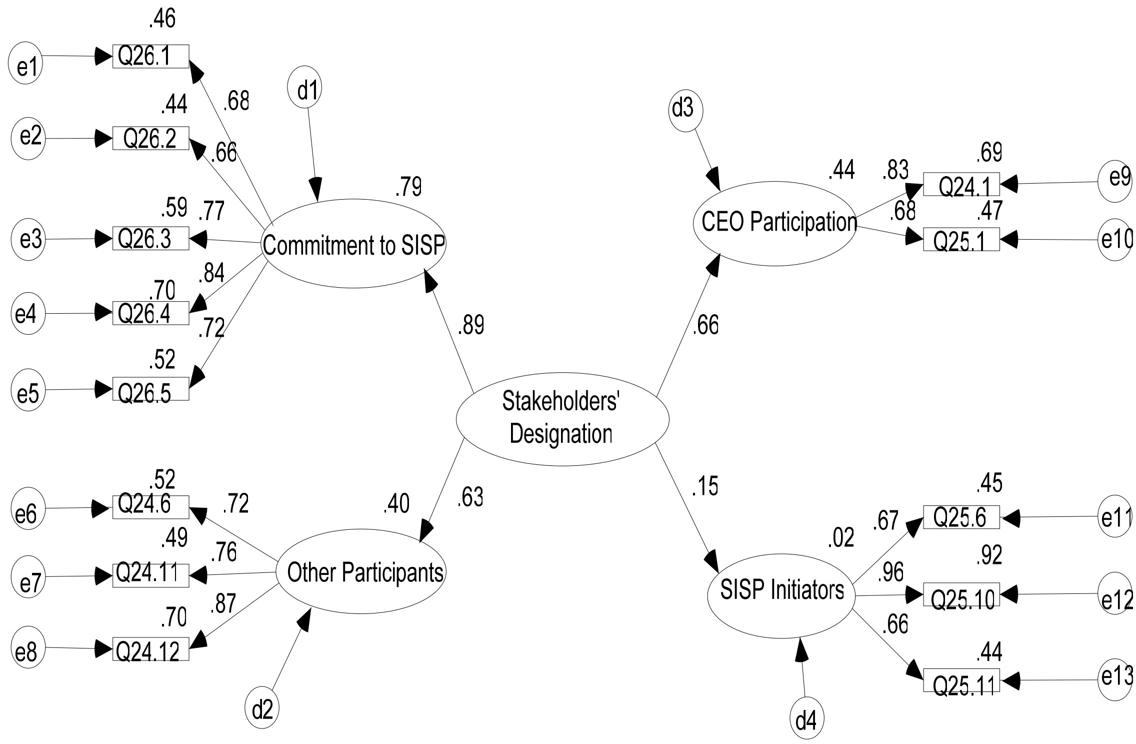

Figure 6.34 Stakeholder's Designation: Measurement and Structural Model

6.8.2.2 Technology

In the SISP literature, IT/IS has been discussed from various positions. IT/IS investments, IT/IS benefits, the IT 'productivity paradox', IS success, measuring of IT/IS performance and similar stance are some of many topics on Information Technology. IT capability can directly influence the business performance of an organisation (Porter and Millar, 1985) and thus SISP gained significant importance as the means of developing strategies for maximizing the use and benefits of IT/IS. This study assesses IT/IS from a completely different viewpoint. IT is assessed only as an enabler for a more efficient planning process. SISP is about and because of IT, but this study considers IT as infrastructure which provides a platform for the integration of information needed for planning, a tool for information analysis and a tool for tracking and measuring the implementation of SISP. 'Planners cannot manage the volume of data efficiently and effectively without automated support' (Lederer and Sethy, 1999: 227). Thus, a more mature IT and IS will enable more the efficient production and implementation of the SISP plan, and thus will contribute to the overall SISP success.

Also, it is natural to expect that the more advanced stages of SISP planning will be based on more capable IT/IS. In general, large organisations have more buying power hence they have more advanced IT infrastructure/applications than smaller companies. All these assumption are tested and results are shown in Table 6.94.

Table 6.94 SISP Success, SISP Maturity and Technologies/Applications Relations

Technology/Application	**Mean**	**SISP Success**	**SISP maturity level**
		Spearman's rho	Spearman's rho
Expert Systems	0.10	0.12 NC	0.28*
Decision support systems	0.44	0.25*	0.23*
Distributed databases	0.40	0.06 NC	0.27*
Data warehousing	0.61	0.30*	0.34*
Data Mining	0.36	0.24*	0.35*
Executive Information Systems	0.46	0.22*	0.35*
Web based technology	0.67	0.12 NC	0.35*
CASE technology	0.10	0.28*	0.28*
Relational Database	0.85	0.27*	0.21*
Client/server network	0.89	0.28*	0.32*
Voice recognition systems	0.18	0.26*	0.27*
Peer-to-peer network	0.30	0.26*	0.46*
Wireless second generation	0.37	0.26*	0.28*
Application infrastructure is integrated	0.57	0.20*	0.41*
Extranet	0.48	0.18**	0.43*
Internet	0.98	0.12 NC	0.17**
Security & risk management infrastructure	0.87	0.00 NC	0.02NC
Separate data, text, imaging/graphics, voice, video	0.51	-0.03 NC	0.01 NC

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (1-tailed).
NC non significant correlation

Table 6.94 shows that SISP success, or in other words SISP efficiency is positively related with technologies which can help with a more efficient production of SISP. For example, data warehousing and data mining can provide easy access to information. Also, Executive Information Systems (a specialised form of Decision Support Systems, intended to help senior executives by providing easy access to both internal and external information) are needed in addressing the strategic needs of the organisation. These systems are more commonly known as Business Intelligence Systems. They offer excellent reporting and drill-down capabilities. The very friendly graphic user interface (GUI) of these systems makes it easy to analyse trends, to monitor performance, to identify opportunities and problems. On the other hand, Expert Systems are not related to SISP success, they certainly have potential as indicated by the relation with SISP maturity, but they are still not significantly used to help strategic planning in Australia. Similarly Broadbent et al. (1999) found a strong association between the integration of information and planning techniques.

The infrastructure which enables the efficient gathering of data for SISP formation is positively related with SISP success, but when it comes to exploration of contribution of specific technologies it is found that Web-based technology and the Internet are not related to SISP success, according to collected data. The security & risk management infrastructure is intentionally placed in Table 6.94 to clearly demonstrate that the infrastructure which cannot help SISP in sourcing, transferring or analysing data from its internal or external environments is not related to SISP success. Also, the last row lists very old technology, which is not in use nowadays. Statistics proved that there is no correlation between this technology and SISP success or SISP maturity levels in Australia.

The technology and applications related to SISP efficiency are less available to small companies (Table 6.95). As the size of a company increases, the level of deployment of this infrastructure increases.

Table 6.95 Company Size and Technologies/Applications Relations

	Company Size				**Correlation coefficient**
	Small	**Medium**	**Large**	**Total**	
	Mean	Mean	Mean	Mean	Spearman's rho
Client/server network	0.60	0.85	1.00	0.89	0.47*
Relational Database	0.40	0.81	1.00	0.85	0.24*
Data warehousing	0.20	0.59	0.71	0.61	0.21*
Application infrastructure is integrated	0.40	0.54	0.68	0.57	0.29*
Extranet	0.20	0.43	0.64	0.48	0.30*
Executive Information Systems	0.00	0.44	0.57	0.46	0.32*
Decision support systems	0.37	0.39	0.57	0.44	0.20*
Wireless second generation	0.20	0.20	0.71	0.37	0.19**
Data Mining	0.20	0.28	0.54	0.36	0.37*
4th Generation language	0.00	0.26	0.43	0.30	0.23*
Peer-to-peer network	0.20	0.24	0.43	0.30	0.16**
Object oriented development environment	0.20	0.19	0.50	0.29	0.22*
Voice recognition systems	0.20	0.11	0.32	0.18	0.17**
CASE technology	0.00	0.04	0.25	0.10	0.36*

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (1-tailed).

Also, the level of deployment of this infrastructure increases with SISP maturity levels (Table 6.96). All relationships are statistically significant as shown in Table 6.94. A monotonic increase in mean values across SISP maturity levels demonstrates the importance of this construct for SISP success.

Table 6.96 Technologies/Applications and SISP Maturity Relations (Mean)

	SISP Maturity Level		
	Attainable Planning	**Sustainable Planning**	**Adaptable Planning**
	Mean	Mean	Mean
Expert Systems	0.03	0.14	0.50
Virtual reality systems	0.00	0.00	0.25
Voice recognition systems	0.08	0.25	0.50
Extranet	0.26	0.64	1.00
Decision support systems	0.33	0.48	1.00
Distributed databases	0.28	0.45	1.00
Data warehousing	0.44	0.73	1.00
Data Mining	0.18	0.48	0.75
Executive Information Systems	0.28	0.57	1.00
Web based technology	0.49	0.80	1.00
CASE technology	0.03	0.14	0.50
4th Generation language	0.18	0.36	0.75
Application infrastructure is integrated	0.36	0.73	1.00
Object oriented development environment	0.15	0.36	0.75
Wireless second generation	0.23	0.45	0.75
Client/server network	0.77	0.98	1.00
Peer-to-peer network	0.08	0.45	0.75
Relational Database	0.77	0.91	1.00

It is important to stress that organisations must be proactive in their use of IT and IS. They should not just react to new technology and the organisational change that technology can trigger (Applegate, Cash and Mills, 1988), instead they should build a rationalised and flexible platform as a result of strategic IS planning.

6.8.2.2.1 Confirming Latent Factor 'Technology'

As discussed in previous sections, the 'Technology' construct is assessed only as a platform capable of enhancing SISP efficiency. From that aspect, three latent factors emerged and they are shown in Figure 6.35. It can be seen that various decision support applications are higher weighted than the IT infrastructure, which mainly comprise of various types of networks. This simple model has the goodness-of-fit indicies shown in Table 6.96. Square Multiple Correlations R2 values are reasonable high, indicating that the model is accounting for a sufficient proportion of the variance. Standardised regression weights for all structural paths are of the same positive sign. This statistics and all other parameter statistics showed that the model fits the data. For clarity purposes error covariances are not shown.

Table 6.97 Technology Model Fit Summary

Model	χ^2	**DF**	**P**	χ^2**/DF**	**RMR**	**GFI**	**AGFI**	**NFI**	**RMSEA**	**CFI**
SISP –Technology	55.6	28	0.001	.1.96	0.008	0.95	0.91	0.92	0.06	0.95

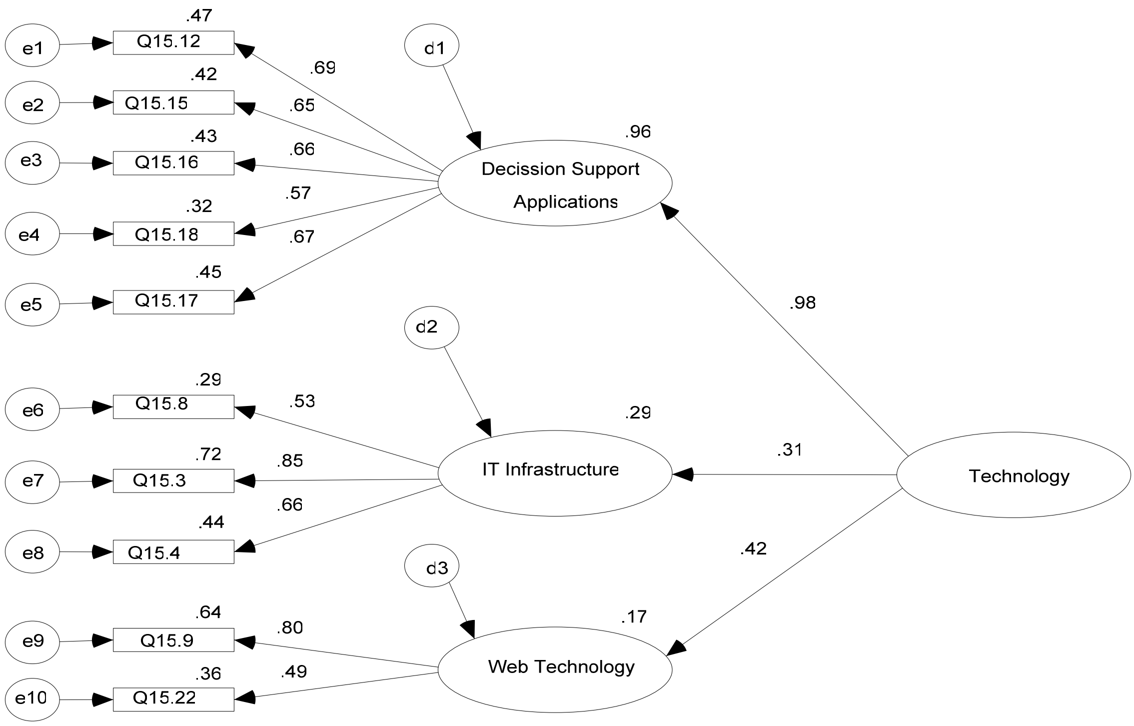

Figure 6.35 Technology: Measurement and Structural Model

6.8.3 Manoeuvrability

Manoeuvrability as a latent construct of overall SISP success is assessed through two dimensions: Viability and Time Dimension. Similarly to previous sections, these two subdimensions are assessed in the context of SISP success, organisational size and the levels of SISP maturity.

6.8.3.1 Viability

In this study, viability, the ability of an organisation to ensure and sustain SISP success, is investigated through two processes: making a SISP plan viable and keeping a SISP plan viable. Viability of SISP is assessed through the dimension of scenario planning, which involves the thorough scanning of organisational external environment. Keeping SISP viable is ensured by conducting regular change reviews and adequate measurements to help an IS organisation stay agile, responsive and proactive. The primary driving forces for scenario planning are an organisation’s immediate environment (suppliers, customers and competitors) and more general external forces such as world economy, social, political, technological forces, etc. (Chi, 2005). The general external environment has an important influence on the organisations (Smits and Poel, 1996). In that context, H12 and H9 are found to be appropriate for testing. These hypotheses are defined as:

H12	A firm's immediate environmental factors have greater influence on SISP success than general external environmental factors.
H9	Regular change reviews will positively influence the success of SISP.

Pressure groups and stakeholders as defined in the survey questionnaire, together with the company's immediate competitive environment define an organisation's immediate environment. Table 6.98 illustrates that mean value for the importance of an organisation's immediate environment for SISP success is higher than for the general environment. This is supported by a positive and strong correlation coefficient, significant at the 0.01 level, therefore providing ground for support of H12.

Table 6.98 Importance of External Environment and SISP Success Relationships

	SISP Success						
	Very poor	Moderately poor	Neutral	Satisfactory	Very Good	Total	Correlation coefficient
	Mean	Mean	Mean	Mean	Mean	Mean	Spearman's rho
A political system and government polices	1	3	1.75	1.86	3.38	1.94	0.26*
The world economy	1.00	1.00	1.40	1.79	2.88	1.66	0.40*
Social issues	1.00	4.00	1.67	1.62	2.38	1.74	0.14 NC
Legal trends	1.00	3.00	1.85	2.41	2.38	2.09	0.22*
Limitations and new business opportunities	1.00	2.00	1.54	1.86	2.13	1.70	0.18*
Technological barriers	1.00	2.00	2.19	2.79	3.25	2.47	0.29*
Pressure groups & stakeholders	1.00	3.00	2.21	3.24	4.13	2.72	0.44*
Company's immediate competitive environment	1.00	2.00	2.15	2.97	3.13	2.49	0.31*

* Correlation is significant at the 0.01 level (2-tailed).
NC Non significant correlation

Social issues such as aging of population, slow growth in population, growth of dual income households, growth of non-traditional households (i.e. singles, single parents, childless) are not seriously considered in SISP as SISP success is not associated with these issues. This means that SISP planners still do not see SISP as a potential weapon for gaining competitive advantage.

Scenario planning frequency revealed that only 16.1% (mean 0.16, std. dev. 0.369) of the surveyed organisations attempted to undertake tool-based, qualitative and quantitative scenario analysis to understand the consequences of a wide range of possible changes. On the contrary, 'standard' predictive studies which assess how the IS/IT function can respond to a different proposed system is conducted at the rate of 46%.

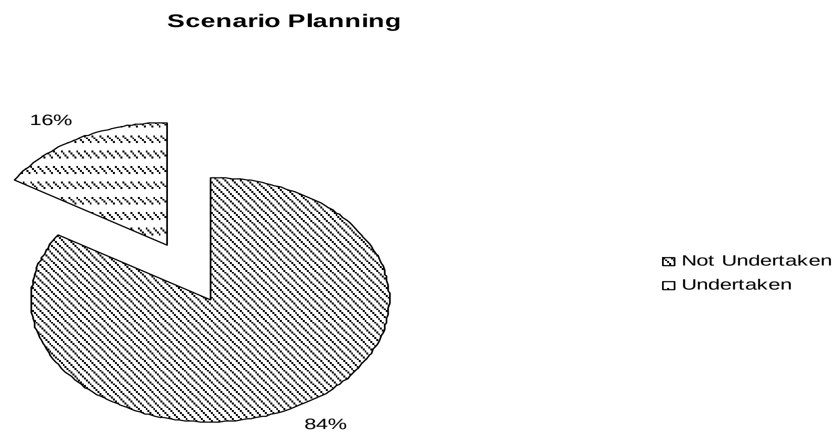

Figure 6.36 SISP Scenario Planning

According to the SISP literature, a greater assessment of the external environment leads to a more successful SISP (Premkumar and King, 1994; Chi, 2005). The major benefit of scenario analysis is for surfacing strategic issues and the IS implication of those strategies and enabling the necessary flexibility from IS (Powell and Powell, 2004). Either scenario planning or contingency planning is not very often performed (Flynn and Goleniewska, 1993). The major difference between the two is that contingency planning is a response to what is known about the future, and scenarios address the uncertainty of the future. Thus, scenario planning is a more difficult exercise. Still, it would be expected that scenario planning is positively associated with SISP success. The mean values shown in Table 6.99 shows that the mean for SISP success is greater when this study is undertaken but this relationship is not significant. This is probably related to the small frequency of undertaking this type of planning. However, the increasing mean values across SISP maturity stages and the significant relationship (rho 0.3 at the 0.01) indicates that this activity will be undertaken more often in the future. This study also finds that this activity has a positive relationship with a company size (rho=0.16 at the 0.05 level).

The scenario planning can be discussed in the light of the two approaches which are appealing for their clarity and simplicity (Saaty, 2001a). Saaty defined these approaches as:

- Forward planning being the process of projecting a likely future (descriptive process);
- Backward planning being the process of identifying a desired future and then working out the details to bring it about (normative or prescriptive process); and
- Forward-backward planning as the process of combining backward planning and forward planning by projecting a likely future, identifying a desired future, determining the policies needed for attending the desired future, and testing their effectiveness to reach the desired future.

He suggests that Forward-backward planning will result in greater effectiveness in planning.

As a projection of the future carry uncertainity, plans should be very often revisited to ensure currency and viability. SISP change reviews are normally associated with SISP implementation. However, they are place when the correction of SISP plan itself can be performed.

Table 6.99 Scenario Planning, SISP Success and SISP Maturity Relationships

SISP Success				SISP Maturity level			
Scenario Analysis	Mean	Std. Dev.	Spearman's rho	**Scenario Analysis**	Mean	Std. Dev.	Spearman's rho
Not Undertaken	3.44	.704	0.11 NC	Not Undertaken	3.52	.554	0.3*
Undertaken	3.71	.810		Undertaken	4.00	.544	

* Correlation is significant at the 0.01 level (2-tailed).
NC Non significant correlation

Figure 6.37 illustrates that in about 65% of cases, some form of change review occurs. Surprisingly, SISP change reviews are mostly a regular or continuous process. Most organisations must plan how to react to change and should be able to change rapidly. Their IT function must respond to change as fast as it occurs. IT should be capable of building or changing systems quickly while simultaneously supporting normal operations. This urge to manage change could have influence on having continuous change reviews.

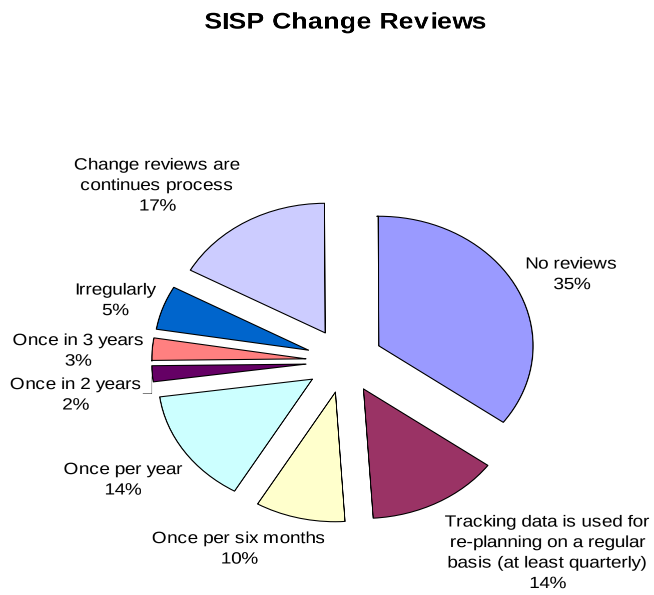

Figure 6.37 SISP Change Reviews

The data in Table 6.100 demonstrate that regular change reviews show positive and statistically significant relationships (at the 0.01 or 0.05 levels) with SISP success, SISP maturity levels and size of company, thus supporting H9. On the other hand, irregular change reviews are not associated with SISP success, which is confirmation that only regular change reviews can ensure that an organisation is on the right track, and will not miss opportunities and could avoid threats.

Table 6.100 Change Review, SISP Success and SISP Maturity Relationships

	SISP Success	SISP Maturity Level	Company Size
	Spearman's rho	Spearman's rho	Spearman's rho
Irregular Change reviews	0.05 NC	0.00 NC	0.19*
Regular (continues) Change reviews	0.37*	0.63*	0.15**

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Non significant correlation

To have successful change reviews, good feedback about SISP implementation (or from any other intermediate process) should be provided. In that regard, the ability to measure and the frequency of measuring play a very important role.

The survey data indicate that only about 26% of organisations measure success/failure of SISP objectives after implementation. About 13% would know (measure) the current situation to have a comparison ground before starting the implementation. During SISP implementation, SISP objectives could be changed due to environmental changes so the measurement procedures should be updated accordingly and the measurements carried out against reviewed objectives. Reports showed that 53.6% of the respondents considered neglecting to adjust the SISP to reflect major environmental changes as a major problem (Teo and Ang, 2001). In Australia, only 16.1% of organisations perform measurements against new (reviewed) objectives. Measurements are performed regularly (before, during implementation and after finishing IS/IT projects) in only 15.5% of cases (Figure 6.38).

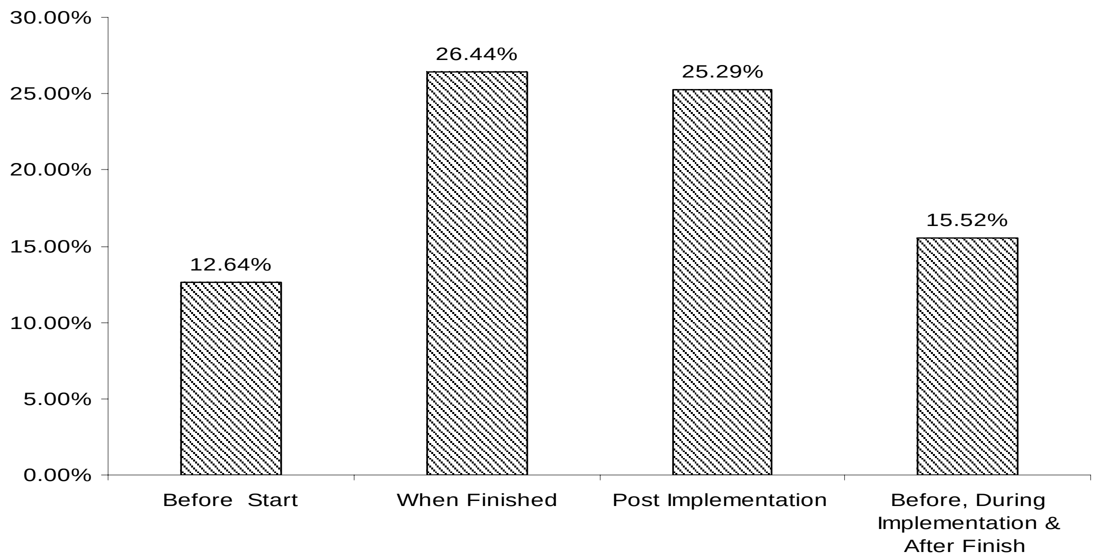

Figure 6.38 Frequency of Measuring Success/Failure of SISP

As the planner must complete the SISP study quickly to facilitate its implementation and avoid the plan becoming obsolete (Lederer and Sethi, 1996), an effective control mechanism must be in place to help the planner adjust the plan. Automation tools can be part of that control mechanism, they can help in metrics collection, data aggregation and analysis. The employment of automation tools would enhance the manoeuvrability dimension of SISP. The survey data revealed that only 8% of organisations use a sophisticated way of collecting and analysing data of what they are trying to measure. There are a number of important elements influencing viability that could be measured. Among others, the measurement of the lost/gained opportunities is considered to be important. Therefore, the influence of this particular measurement is investigated in more depth. It is found that measuring the lost/gained opportunities is statistically significant related to SISP success (0.18, at the 0.05 level) and also to SISP evolution stages (0.26, at the 0.01 level), while the relationship with company size is not found.

6.8.3.1.1 Confirming Latent Factor ‘Viability

Figure 6.39 shows that the Viability for the purpose of statistical validation is assessed through four latent factors, as discussed in the previous section. A review of all parameters showed that all estimates are reasonable and statistically significant. The standard goodness-of-fit statistics are shown in Table 6.101. Again for clarity purposes, the error covariances are not shown.

Table 6.101 SISP Viability Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP –Viability	121.17	65	0.000	.1.86	0.03	0.95	0.89	0.92	0.06	0.96

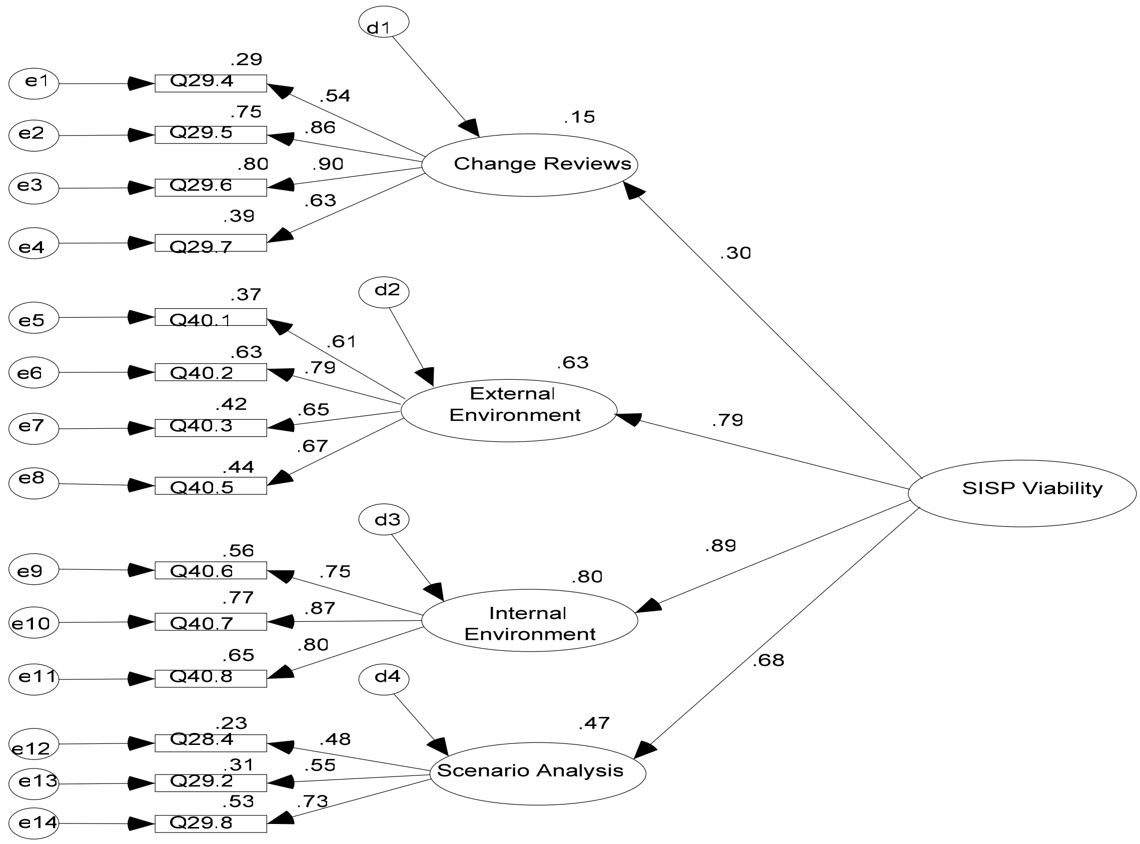

Figure 6.39 SISP Viability: Measurement and Structural Model

6.8.3.2 Time Dimension

Time is money
(Benjamin Franklin)

There is no doubt that time plays an important role in many aspects of planning. Planning and a plan implementation process must ensure that there is an acceptable level of delay between information collection, analysis and the use of information.

Comprehensive planning or incremental planning depends on the chosen time horizon. The choice of time horizon is dictated by many factors. The external environment as well as the internal organisation's objectives dictates a time horizon. The business planning horizon mostly (56%) influences the choice of the IT planning horizon (Flynn and Goleniewska, 1993). Deciding on too long a planning horizon (33.8%) is seen as the bigger problem than deciding on a too short planning horizon (28.7%) (Teo and Ang, 2001). Chi et al. (2005) investigated whether a longer planning period requires a greater need for examination of the external environment. Surprisingly, they could not find support that a longer term SISP planning would require more environmental assessment. Lederer and Sethi (1988) stated that a planning horizon is a control mechanism which puts pressure on planning participants to meet dead lines and problems associated with SISP are more severe if a planning horizon is not specified in a SISP study.

This study finds (Figure 6.40) that a five-year SISP planning is very scarcely exercised (6.9%). The mean values in Table 6.102 as well as the percentage presentation in Figure 6.40 indicate that one-year formal planning is the most often chosen time frame for conducting SISP (62.07% against 40.23% for 3-year planning horizon). The average planing horizon is 1.99 years. This result is not consistent with other studies. The SISP literature reports that the time horizon of SISP planning is 3 or 5 years (Premkumar and King, 1991) and the avarage of 3.73 years (Lederer and Sethi, 1999).

Table 6.102 SISP Planning Horizons: Descriptive Statistics

	Mean	Std. Deviation
One-year formal SISP plans	3.28	1.36
Three- year SISP plans	2.76	1.47
Five -year SISP plans	1.86	0.98

It is important to examine the relationships between every planning horizon of SISP and SISP success. At first glance the results in Table 6.102 are in agreement with the SISP literature which reported that planning horizons are becoming shorter and shorter (Chi et al., 2005). Interestingly (Figure 6.40) the same percentage (12.64%) of the surveyed population responded with 'strongly agree' for both one and five year planning horizons. If it is proven then a shorter planning time has a significant positive relationship with SISP success, and is more often associated with SISP success, then this is an important signal to practitioners who strongly believe that longer term SISP planning is more beneficial.

Table 6.103 SISP Planning Horizons: Correlation Statistics

	SISP Success	SISP Maturity Level	Company Size
	Spearman's rho	Spearman's rho	Spearman's rho
One-year formal SISP plans	0.24*	0.50*	0.18**
Three- year SISP plans	0.29*	0.36*	0.29*
Five -year SISP planning	0.27	0.22*	0.29*

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).

Table 6.103 shows that each planning horizon has a significant, positive relationship with SISP success at the 0.01 level of confidence.

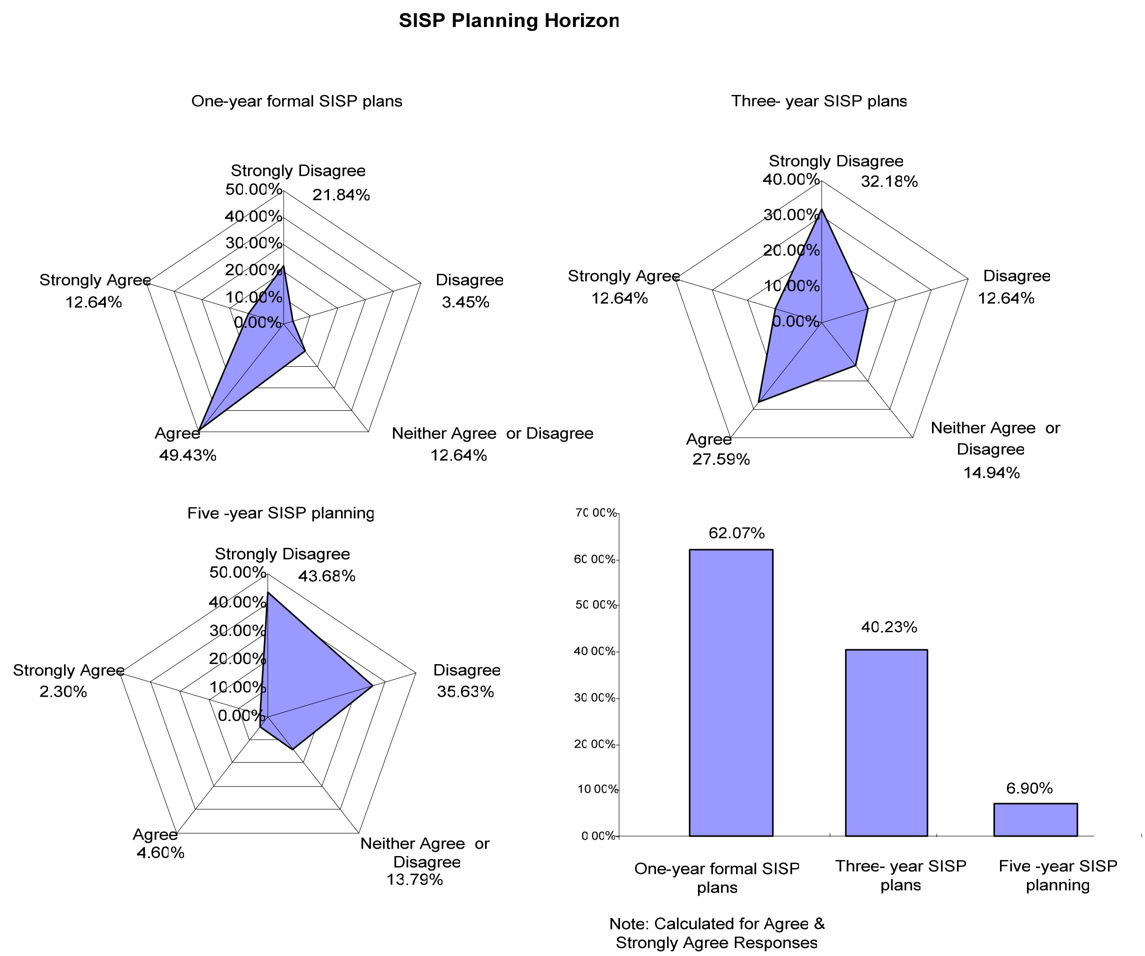

Figure 6.40 SISP Planning Horizons

Crosstabulation between the SISP planning horizons and SISP success is provided in Table 6.104 to examine their relationships. The aggregated (mean) values are closely investigated in 'positive' quadrants, which are highlighted in Table 6.104.

Table 6.104 Crosstabulation: SISP Planning Horizons and SISP Success

		SISP Success				
		Very poor	Moderately poor	Neutral	Satisfactory	Very Good
One-year SISP planning	Strongly Disagree	1.15%		19.54%	1.15%	
	Disagree		1.15%	1.15%	1.15%	
	Neither Agree or Disagree			2.30%	8.05%	2.30%
	Agree			25.29%	18.39%	5.75%
	Strongly Agree			6.90%	4.60%	1.15%
Three- year SISP planning	Strongly Disagree	1.15%		24.14%	6.90%	
	Disagree			4.60%	6.90%	1.15%
	Neither Agree or Disagree			9.20%	4.60%	1.15%
	Agree		1.15%	12.64%	9.20%	4.60%
	Strongly Agree			4.60%	5.75%	2.30%
Five -year SISP planning	Strongly Disagree	1.15%		31.03%	9.20%	2.30%
	Disagree		1.15%	14.94%	14.94%	4.60%
	Neither Agree or Disagree			5.75%	8.05%	
	Agree			3.45%		1.15%
	Strongly Agree				1.15%	1.15%

If the success of planning horizons is to be judged only by this criterion (agree/strongly agree for a plan execution versus satisfactory/very satisfactory for SISP success) then a three-year planning period horizon indicates the most successful SISP. From the 40.24% of the population who clearly performed three-year planning, 21.85% were happy with SISP, which is an overall of 54.3%. Then, a five-year horizon has 50% satisfaction rate, thus one-year SISP planning comes in the third position with 48.2%.

Table 6.105 Difference in Means: SISP Planning Horizons and SISP Success

One-year SISP planning	SISP Success	Three- year SISP planning	SISP Success	Five -year SISP planning	SISP Success
Strongly Disagree	2.95	Strongly Disagree	3.14	Strongly Disagree	3.26
Disagree	3.00	Disagree	3.73	Disagree	3.65
Neither Agree or Disagree	4.00	Neither Agree or Disagree	3.46	Neither Agree or Disagree	3.58
Agree	3.60	Agree	3.63	Agree	3.50
Strongly Agree	3.55	Strongly Agree	3.82	Strongly Agree	4.50

However, if the success of the planning horizon is to be measured by the overall means, the five-year planning is best followed by three year and one-year planning (Table 6.105). To conclude, the difference in success rates between the planning horizons is not so significant. In any case, one-year strategic plans are the least successful way of planning. This finding is an agreement with the findings that planning for less than 2-3 years is useless (Premkumar and King, 1991). This could be because a one-year horizon cannot provide the needed strategic dimension. It could reflect more tactical planning for the expected future than the strategic ability of manoeuvres in uncertainty. Usually, the implementation of IS programs takes longer than one year, thus longer planning horizons are needed, perhaps with the incremental planning taken at least once a year.

Table 6.103 also shows that each planning horizon has a significant, at the 0.01 or 0.05 level of confidence, positive relationship with SISP maturity and the size of an organisation.

The time dimension of the SISP process is not characterised only by the planning horizon. For example, the time needed to complete the SISP study, the time needed to re-plan, the frequency of change reviews, the time dimension attached to the sets of scenarios could play a crucial role in SISP. A lengthy SISP process could jeopardise the SISP manoeuvrability as the ability for quick reaction to change could be lost. On the other hand, if SISP is finished too quickly the plan could be superficial.

6.8.3.2.1 Confirming Latent Factor 'Time Dimension'

The estimation of the model shown in Figure 6.41 demonstrates that four latent factors are well-fitting for the data. All measurement and structural coefficients are reasonable and the selected goodness-of- fit statistics shown in Table 6.106 and all other parameters are acceptable, thus this model fits the data.

Table 6.106 SISP Time Dimension Model Fit Summary

Model	χ^2	DF	P	χ^2/DF	RMR	GFI	AGFI	NFI	RMSEA	CFI
SISP –Time Dimension	89.99	52	0.001	.1.73	0.06	0.95	0.90	0.90	0.05	0.97

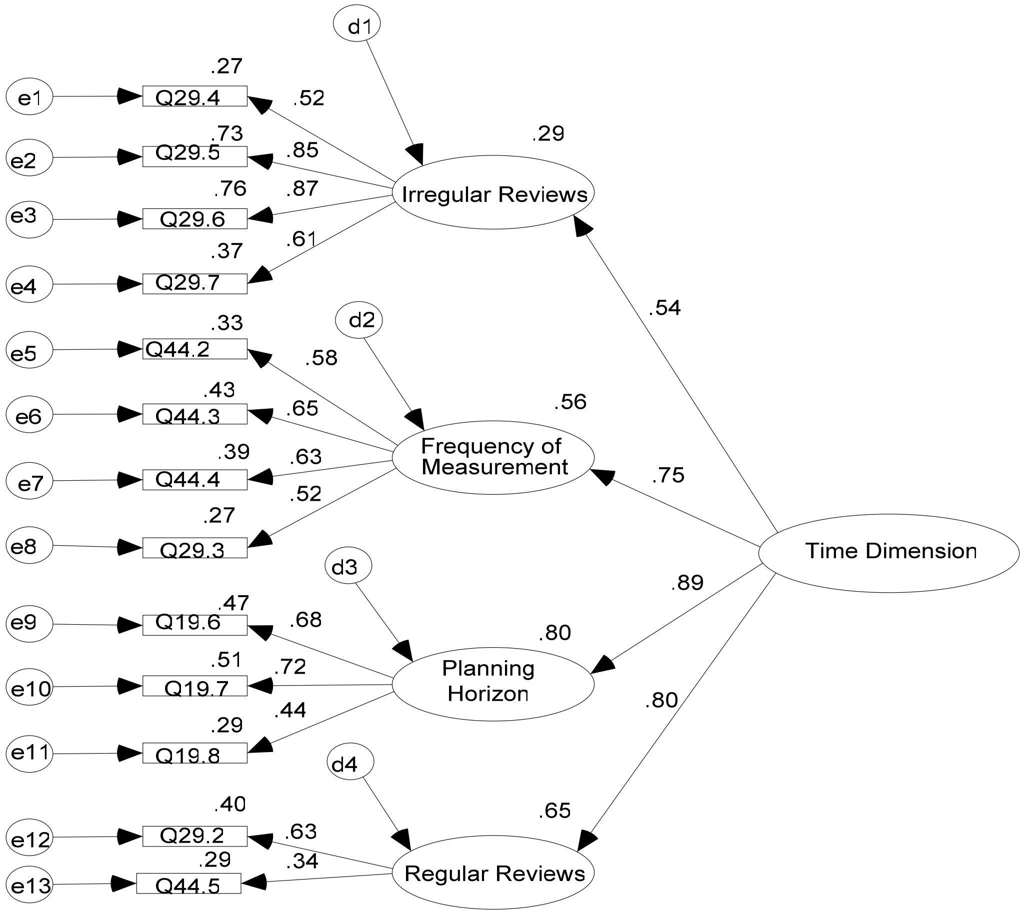

Figure 6.41 SISP Time Dimension: Measurement and Structural Model

6.9 SISP Measurement

Objective measurements of organisation intangibles and tangibles were always and are still a very difficult exercise. The importance of developing such measures is very often reported in the SISP literature (Fitzgerald, 1993, Simons. 2000). One of the key barriers to successful SISP is a lack of measurement of IT values and effectiveness used by the IS department (detailed in Chapter2). Teo et al. (1997) found that 98.3% of the Singaporean firms he investigated rated 3 and above on a five-point Likert scale of the importance of having such objective measures. They also reported that only 25.8% of organisations had objective measures of the IS contribution to productivity. This study measures the extent to which Australian organisations have a clear understanding of what to measure, how to measure and how often to measure various objectives.

6.9.1 SISP Measurement Methods

Table 6.107 shows how the SISP formulation and implementation objectives are measured.

Table 6.107 Measurement Methodology: Descriptive Statistic

Rank	Measurement Methodology	N	Mean	Std. Dev.
1	Return on investment	260	0.37	0.48
2	Business process enhancement	260	0.26	0.44
3	In - house developed technique is used	260	0.20	0.40
4	For every IS project a specific methodology is developed	260	0.18	0.39
5	Interviewing the champions	260	0.16	0.37
6	Balanced scorecard	260	0.16	0.37
7	Return-on-management	260	0.11	0.32
8	Value added	260	0.10	0.31
9	Critical appraisal	260	0.10	0.31
10	Goal - Question - Metrics	260	0.09	0.29
11	Using ad hoc procedure	260	0.06	0.23
12	Experimental methods	260	0.02	0.15
13	Case base reasoning	260	0.02	0.15
14	Information economics	260	0.02	0.15
15	Boundary values	260	0.01	0.11

The most used methods to measure the extent of SISP achievement is return on investment and business process enhancement (Table 6.107). The measurement of SISP performance in financial terms is not recommended because of the complexity to isolate the effect of SISP from the financial performance of an organisation (King, 1988). However, it could be that fifteen years after King's study, the ability to measure SISP in financial terms has improved. There is a noticeably low level use of in-house developed measurement techniques and a relatively high percentage of subjective measurements (interviewing the champions).

6.9.2 Quality of SISP Measurement

This study assesses the quality of the performed measurements (Figure 6.42). The quality is measured by assessing the existence of formal documents which outline the purpose (like software quality), scope (selection of applications) and attributes (like functionality, reliability, code reusability). About 52% of the population have established these formal documents. However, only 43% have clearly defined work plan details (as who is responsible for gathering data, when the metrics will be collected and how the metrics are reported).

The measurement of the intangible values proved to be difficult. Only 31% of respondents do not have problems with defining the attributes of the natural scales (like a scale for user satisfaction, the service/product level expected) and confirming the accuracy of the measuring instrument (to know measurement error or variability).

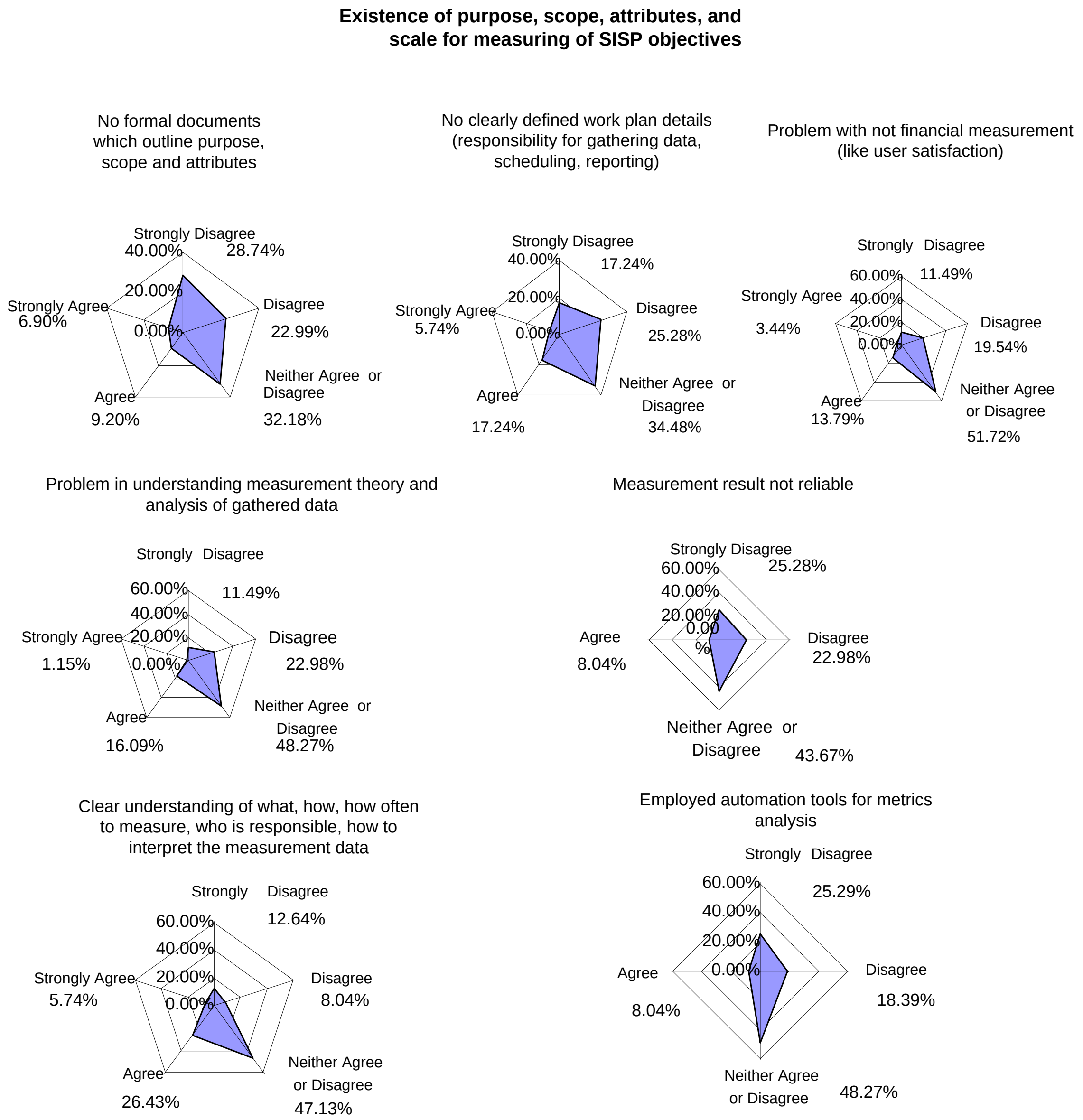

Figure 6.42 Quality of SISP Objectives Measurement

About 17% of respondents have a problem in understanding measurement theory and the analysis of the gathered data, while 48% believe that the results obtained seem to be reliable (such as measurement of side effects when people make the numbers look better).

A clear understanding of what to measure, how to measure, how often to measure, who is responsible for the measurement, and how to interpret the measurement data and doing it satisfactorily is confirmed by 32% of the sampled population. Only 8% employed automation tools for metrics collection, aggregation and analysis. It is noticeable that there is a large percentage of undecided (neither agree or disagree) for all these statistics, ranging from 32% to 52%.

6.9.3 Scope of SISP Measurement

The assessment of the subjects of measurement did not reveal any unexpected results. Financial benefits and cost related to SISP outputs are on top of the list. However, Table 6.108 shows that some organisations attempt to measure the effort and cost of collecting measurement data (13.8%).

Table 6.108 Measurements during Preparation and Implementation of SISP: Descriptive Statistic

Rank	Measurements	Percentage	Mean	Std. Dev.
1	What are the costs (as investment costs for IT)	49.43	0.49	0.50
2	Business value delivered (return on the investment in IT projects)	48.28	0.48	0.50
3	Customer satisfaction with the deliverables	36.78	0.37	0.48
4	The IT department performance	34.48	0.34	0.48
5	What are the costs as cost (per unit, such as the cost of internet access per user etc?)	31.03	0.31	0.46
6	Quality of deliverables	29.89	0.30	0.46
7	What is value of the lost/gained opportunity?	21.84	0.22	0.41
8	How effective are we at doing SISP implementation	20.69	0.21	0.41
9	Effort and cost of collecting measurement data	13.79	0.14	0.35
10	Duration of SISP processes	11.49	0.11	0.32
11	Individual performance	10.34	0.10	0.31
12	How efficient is SISP formulation process	6.90	0.07	0.25

Too much measurement as well as too little measurement is often reported (Austin, 1996; Wexelblat & Srinivasan, 1999). Measurement/monitoring costs can be high and that will determine whether to control inputs, processes or outputs (Simons, 2000). Thus the SISP process itself can be very costly and the efficiency of SISP formulation and the duration of SISP processes are measured in 7% and 11.4% of the cases respectively. These percentages are very low. According to the SISP literature, these measurements should have an influence on SISP success. To test that relationship, correlation statistics are obtained and shown in Table 6.109.

Table 6.109 SISP Measurements, Success, Maturity and Company Size Relations

	SISP Success		Company Size		SISP Maturity	
	Mean	Spearman's rho	Mean	Spearman's rho	Mean	Spearman's rho
How efficient is SISP formulation process	4.17	0.25*	2.17	-0.03 NC	4.00	0.22*
How effective are we at doing SISP implementation	4.22	0.52*	2.28	0.01 NC	4.17	0.46*
What are the costs as investment costs	3.72	0.31*	2.37	0.20*	3.84	0.42*
Customer satisfaction with the deliverables	3.72	0.24*	2.34	0.13 NC	3.94	0.46*
Business value delivered	3.79	0.43*	2.40	0.24*	3.95	0.60*

* Correlation is significant at the 0.01 level (2-tailed).
NC Non significant correlation

Table 6.109 shows that some measurements are related to SISP success. The measurement of efficiency and effectiveness of SISP processes has a positive and statistically strong relationship with SISP success at the 0.01 significance level. In particular, the mean value of SISP success is very high for these two measurements. In addition, the results suggest that the measurement of the intangibles like customer satisfaction with SISP deliverables is important to the success of SISP.

The following items are dropped after conducting factor analysis, but extra effort was made to confirm that they are really not relevant to SISP success. The relationship between the duration of SISP and SISP success is not statistically significant, and this is an unexpected finding. Also, the correlation for individual performance, IT department performance, and effort and cost of collecting measurement data are also not statistically significant, and not unexpected.

Even though, most individual items in Table 6.109 show a non-significant correlation with company size, all items together (the factor level) correlated significantly (rho=0.243, at the 0.01 level).

6.9.4 Objectives of SISP Measurement

Similarly to SISP objectives, SISP measurement objectives are unidimensional (one factor scale). Organisations have multiple measuring objectives. Table 6.110 shows the descriptive statistics from which the more common measuring objectives can be seen.

Table 6.110 SISP Measurements Objectives: Descriptive Statistics

Measurement Objectives	Mean	Std. Dev.
Improve estimating for the future plans	0.34	0.48
To gain top management support for the future projects	0.36	0.48
To identify and communicate the best practices	0.46	0.50
Improve control of IT/IS projects in terms of cost and time	0.48	0.50
Increase maneuvering power	0.08	0.27
Other	0.06	0.25

This table has the item ‘Other’ which could be taken from the scale without losing information. The survey reports a small number of additional measurement objectives. A close examination confirmed that despite the different wording they do not comprise a new category of objectives. Examples of content of the ‘Other’ item are: cost benefit & cost reduction, to demonstrate IS key business capability, resource management, and improve our planning overall to increase collaboration.

The item ‘increase manoeuvring power’ has the lowest mean. This objective is specified to assess whether the measuring of SISP is used for strategic purposes. Without measurement there is no feedback (or feedforward) information which enables control. If the measurement signals underperformance or other deviations from the optimal running of processes, corrective actions (such as replanning with possible new strategies) should be taken. Thus, measurement could increase manoeuvring power. The low score on this objective shows that measurement in Australia has room for enhancement, and that this area will be one of the key IS management issues for a long time.

As SISP objectives influence SISP success (proven in previous sections), the study argues that similarly, SISP measurement objectives are associated with SISP success and SISP maturity levels. The correlation (Spearman's rho) between SISP measurement objectives and SISP success, SISP maturity levels, and the organisation size is 0.507, 0.512, and 0.240 respectively, and they are significant at the 0.01 level of confidence. The item level correlation shown in Table 6.111 shows that the relationship between the SISP measurement objectives and company size is not valid for individual objectives but valid for a set of objectives.

Table 6.111 SISP Measurements Objectives: Relationships

	SISP Success		**SISP Maturity Level**		**Company Size**	
	Mean	Spearman's rho	Mean	Spearman's rho	Mean	Spearman's rho
Increase maneuvering power	4.29	0.31*	3.86	0.12 NC	2.43	0.11 NC
Improve estimating for the future plans	3.83	0.34*	3.77	0.20*	2.30	0.05 NC
To identify and communicate the best practices	3.83	0.44*	3.93	0.53*	2.38	0.20*
Improve control of IT/IS projects in terms of cost and time	3.79	0.41*	3.81	0.38*	2.36	0.15**
To gain top management support for the future projects	3.77	0.28*	3.77	0.22*	2.39	0.18**

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
NC Non significant correlation

6.9.5 Success of SISP Measurement

Similarly to SISP success, the success of SISP measurement is assessed through a single item which measures the respondent’s perception of the overall satisfaction with the accomplishment of the objectives of SISP measurement.

This section addresses the hypothesis H10 which tests the following:

H10	The more mature SISP, the more satisfaction is obtained with the accomplishment of SISP measurement objectives.

The descriptive statistics for the success of the SISP measurement objectives is shown in Table 6.112. The majority of organisations (60.92%) are neutral, and only 5.75% are not satisfied with the achieved measurement objectives. About 30% of the SISP population in Australia is satisfied with their measurements and 3.45% thought that the measurement achievements are very good or excellent. The mean value of satisfactions is 3.3 on a scale 1 to 6, which clearly shows that the success of the practice of SISP measurement is not on a sufficiently high level. IS organisations must be agile, responsive and proactive.

Table 6.112 Accomplishment of SISP Measurements Objectives: Descriptive Statistics

Overall satisfaction with accomplishment of measurement objectives			
	Percent	Mean	Std. Deviation
Very poor	3.45%	3.29	0.76
Moderately poor	2.30%		
Neutral	60.92%		
Satisfactory	29.89%		
Very good	2.30%		
Excellent	1.15%		

The study assesses the sustainability of SISP measurement success over a three-year period of time. It is expected that by measuring how well SISP is done this year, it will help improve planning next year and so on. The results shown in Table 6.113 do not support that reasoning. It seems that the benefits of SISP measurement declined over time. The mean value of the benefits of 3.29 in the first year dropped to 2.99 in five years.

Table 6.113 Benefits of SISP Measurement over Time: Descriptive Statistic

	Benefit of SISP measurement over the past one year Mean	**Benefit of SISP measurement over the past two years** Mean	**Benefit of SISP measurement over the past five years** Mean
Very poor	2.30	3.45	5.75
Moderately poor	2.30	3.45	8.05
Neutral	68.97	70.11	70.11
Satisfactory	18.39	17.24	13.79
Very good	6.90	5.75	2.30
Excellent	1.15		
Total Mean:	**3.29**	**3.18**	**2.99**
Std. Deviation	0.77	0.74	0.74

This is an important observation. The goal of having measurements in the first place is to improve the success of objectives, which should be an on-going process and not an irregular activity. Measurement, as a control mechanism, should point to weak areas and correction effects should continually improve the success of objectives, year after year building on the measurement in previous years.

To test H10, a correlation between SISP maturity and the accomplishment of SISP measurement objectives is calculated. The Spearman's rho correlation coefficient of 0.29, at the 99.9% confidence level, indicates the existence of this relationship. To test whether satisfaction with the SISP measurement objectives is increasing when SISP maturity is increasing, Table 6.114 is provided. An increasing value of the means over SISP maturity stages indicates support for H10. Also, a reverse relationship, shown in the same table, demonstrates that the SISP measurement success is monotonically increasing when SISP maturity increases.

Table 6.114 Accomplishment of SISP Measurement Objectives: Relationship with SISP Maturity

	SISP Maturity Level		**Accomplishment of Measurement Objectives**
Accomplishment of Measurement Objectives	Mean	**SISP Maturity Level**	Mean
Very poor	3.33	Attainable Planning	**3.08**
Moderately poor	4.00	Sustainable Planning	**3.43**
Neutral	3.45	Adaptable Planning	**3.75**
Satisfactory	3.85	Total	3.29
Very good	4.00		
Excellent	4.00		
Total	3.60		

6.10 Conclusion

This chapter answered the secondary research questions defined in chapter 1, thus the summary of results and outcomes of the testing of the hypotheses are organised around those research questions.

What is the degree of SISP maturity in Australian organizations?

The SISP maturity model established in chapter 4 and the survey data are used to answer this question. The data synthesis revealed that the majority of Australian organisations are at the Attainable or Sustainable Planning level. Very few organisations actually reached the Adaptable Planning, the highest SISP maturity level. The analysis of the research data assessed the relationships between SISP constructs to confirm/discover relationships between SISP maturity levels, SISP success and organisation size. The results obtained were used to test the hypotheses. The following is a summary of the test results:

H1 As SISP evolves towards higher maturity levels, the level of SISP benefits will increase: supported.

H2 The existence of a formal approach to SISP planning will have a favourable effect on overall success of SISP: supported.

H3 As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases: partially supported.

H3a The highest level of SISP maturity tends to decrease the use of formal (packaged) methodologies: supported.

H4 As the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases: supported.

H5 If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful: not supported.

H6 As senior management commitment towards SISP formulation increases, SISP success increases: partially supported.

H6 a As senior management commitment increases, SISP success increases until it (success) reaches a maximum; as senior management commitment continues to increase, SISP success decreases: supported.

H7 As awareness towards cultural issues and other causes of resistance increases, SISP success increases: supported.

H8 A more skilful SISP team produces more successful SISP: supported.

H9 Regular change reviews will positively influence the success of SISP: supported.

H11 The more mature SISP, the more the impact of external environmental factors is considered: supported.

H12 A firm's immediate environmental factors have greater influence on SISP success than general external environmental factors: supported.

H13 As SISP evolves towards higher maturity levels, the level of planning success will increase: supported.

H14 The larger the organisation, the greater the level of SISP maturity: supported.

What are the key reasons for the SISP implementation success/failure in Australian organisations?

First, the key issues in IT management were ranked and discussed. Aligning IT strategy with business strategy is still the number one key issue of IT management. Meeting business and user needs and security issues are the second and third ranked issues. Then, the key reasons for the SISP formulation and the SISP implementations failures are discussed. A lack of commitment from senior management, budget limitations, the lack of senior management involvement are identified as the three major reasons for SISP formulation failures. A lack of commitment from senior management, a lack of alignment with business objectives and IS management not part of the corporate planning process are the three key reasons for the SISP implementations failures. The reasons for SISP failure are discussed in light of SISP maturity and organisational size.

What are the best practices in the measurement of SISP implementations and how successful is the measurement of SISP in Australian organizations?

The measurement section of chapter 6 answered this question by investigating measurement methods, quality of SISP measurement, scope, objectives and success of SISP measurement. Also, the following hypothesis was tested.

H10 The more mature SISP, the more satisfaction is obtained with the accomplishment of SISP measurement objectives: supported.

A significant number of relationships within the SISP constructs was investigated but not reported in this concluding section. Instead, those findings, their implication for theory and practice are discussed in the next chapter.

CHAPTER 7

7 DISCUSSION AND CONCLUSIONS

7.1 Introduction

This chapter discusses the importance of this study for the SISP theory, the contributions that this research has made to SISP research methods and the potential implications of this research to SISP practice. In particular, these implications are suitable for practitioners as this study offers the potential for developing diagnostic tools for the SISP practitioner to use.

The chapter is structured as follows. A summary of the preceding chapters is provided. First, the proposed theoretical models are discussed to assess their contribution to the SISP theory. Then, empirical findings are reviewed in the light of their implications for theory and practice.

The commitment to both a wide area of investigation, to provide a holistic perspective on SISP, and a micro-analysis, to investigate the content of the relations between variables, yields a number of research limitations. These limitations are discussed in this chapter. The research process revealed some issues which could not be tested within this study. These issues are detailed as suggestions for future research.

7.2 Summary of the Research Work

The discussions in this section mainly follow the natural way of progress of this thesis. After an overview of the main objectives and challenges this study faced, a summary of the main characteristics of the models developed is presented and then the empirical findings are summarised.

7.2.1 Context and Issues

The main aim of this study was to find a method to effectively assess SISP as a complex phenomenon and then measure it in Australian organisations. Therefore, this task had two goals: (1) to provide a model for SISP assessment and thus give a theoretical contribution to the SISP community and (2) to define measurement scales and measure the assessment data, helping SISP practitioners to understand constituents of successful SISP and the reasons why they make SISP a successful process. It is worth to point out the difference between assessment and measurement in the context of this research.

Assessment and measurement are two separate but related tasks. The role of assessment was:

- To understand what to focus on.
- To define the criteria for assessment.
- To select a suitable methodology to organise investigations in a structured way.
- The compare the collected data to establish a standard for the purpose of judging SISP.

The role of measurement was:

- To establish a measuring instrument.
- To estimate magnitudes of quantities and relations relative to a particular focus of assessment.
- A quantify the assessment results as a single overall measure.

Thus, the measurement was the collection of information relative to the measuring instrument and the assessment was the use of the collected information to make a judgment relative to SISP objectives or goals.

To accomplish the aim of the study was found challenging because:

- There was no study which attempted a similar task on such grand scale.
- There was no study which attempted to assign a single overall measure to SISP maturity.
- There was no adequate standard against which to assess SISP as a whole.

Consequently, this research is breaking new ground in many ways.

Despite a plethora of SISP studies, very few attempts were made to describe the evolution of SISP as a planning process per se. Instead, an overall function of IT is investigated and the stages of IT growth are explored. Therefore, to be able to conduct the assessment of SISP maturity, the first step was to fill this gap and define the evolutionary stages of SISP. The intention was to use these SISP maturity stages as a standard against which to compare the levels of SISP maturity in an organisation. The study draws attention to the fact that SISP evolution, SISP maturity stages and SISP maturity levels are used interchangeably.

The main characteristic of this model was its conceptual nature. For the measurement purpose, operationalisation of this model was necessary. That process involved definition of criteria, subcriteria and variables for the assessment of SISP maturity.

Confronted with a huge amount of variables and interactions and having set a goal to obtain a single overall measure for the level of SISP maturity in an organisation, this study found that none of the reported methods is powerful enough to achieve this goal. The study faced two problems:

- A problem of comparing the importance of the tangible and intangible properties of SISP elements measured by different scales.
- A problem of synthesis of influence of the tangible and intangible elements measured by different scales on the SISP constructs or the overall SISP.

Therefore, the study was forced to examine the available methodologies outside the boundaries of standard SISP theory.

Having defined the secondary research questions and a number of objectives in relation to those questions, the exploration of relationships between various SISP variables are needed.

The function of this section is to offer an overall comprehension of the research efforts in order to support the discussions which follow in the next sections. A graphical illustration of the above mentioned steps is depicted in Figure 3.2

7.2.2 SISP Theoretical Models

To be able to offer the model for the assessment of SISP, the study investigated ways of reducing the complexity of the SISP process. The main task of the model building was to enhance the understanding of the real world by simplifying the complex relationships in a structured way and offering guidelines for the interpretation of the concepts developed. In addition, the study operationalized the concepts to empirically validate the proposed theory. To build the models needed to support the research question, an engineering approach to SISP was found to be an appropriate starting point (Chapter 3).

It offered enhanced manageability of the SISP constructs through its input, process, and output orientation. Under this approach SISP, is presented as a system defined by its structure, behaviour and evolution, and feedback and feedforward mechanisms are explored as they can help in improve SISP monitoring and control.

As stated, the Engineering approach was a foundation to interact with SISP. The complexity of SISP is dealt by selecting the Analytic thinking method which allowed the analysis of SISP in a holistic perspective by breaking it down into subsystems, components and elements, where a large amount of information is integrated to form a more complete picture of the whole SISP system. SISP subsystems are organised in a hierarchy or network, allowing the study of simultaneous interactions of its components/elements. Therefore, AHP is a process of ‘systematic rationality’, which does not insist on linear thinking (Saaty, 2001b). In general, ANP/AHP is a non-linear framework which enabled more realistic assessment of SISP as SISP in its complexity is rather non-linear process. ANP/AHP has been successfully applied in corporate planning, portfolio selection, and cost/benefit analysis. It is important to stress that ANP/AHP allowed considering more SISP elements than the study would ordinarily consider. The study named this approach as an Integral Engineering approach.

SISP is considered as a subsystem of Information Systems within an organisation. The study offered a perspective of the major constituent elements of an Information System (Figure 2.4) as these elements influenced the SISP subsystem and/or are influenced by the SISP subsystem. Thus, the question of the SISP external environment is brought into the discussion. The positioning of SISP within its immediate external environment is presented in Figure 2.7. The SISP internal environment is addressed through an input/output engineering approach to interrelations within its structure attributes. All three SISP system attributes (behaviour, structure and evolution) are then explored in great detail (Chapter 2). The following discussion is organised around each SISP attribute.

7.2.2.1 The SISP Evolution Model

The study discussed the importance of knowing the SISP evolution (history) in Chapter 2. Without history it would be impossible to learn about SISP, as knowing the past, a certain information pattern can be recognised which can help in ‘predicting’ future trends. Therefore, SISP evolution is investigated for two reasons:

- To recognise the current SISP evolutionary perspectives.
- To gain capability of projecting the next SISP evolutionary stage.

However, the approach of ‘projecting’ the future of SISP evolution is not taken as ‘futuristic’ prediction of the unforeseen future but rather as the modelling of the most advanced SISP stage, which would be an ideal model at the current level of comprehension.

The discussion in Chapter 2 revealed that a simple ‘era’ approach to SISP evolution cannot hold. A few SISP studies attempted to assess the SISP maturity stages in terms of the evolution of planning processes alone, therefore the study found a need for enhancing SISP theory by distinguishing SISP evolution from the progress in IS/IT and an organisation’s maturity. Consequently, the study proposed the five-stage model of SISP maturity defined in Chapter 4 and summarised as follows:

- **Rudimentary Planning** (not a formal IT plan, plans are ad hoc, basic, and very often just financial plans to acquire hardware and software);
- **Ineffectual Planning** (formal but basic plans, more tactical than strategic, out of date and incomplete, IS vision, goals, and objectives are set but are not aligned with business goals, formal methodologies intermittently followed);
- **Attainable Planning** (a reasonable level of planning, still more tactical than strategic as IS projects are embedded in the IS plan, SISP is current to within one year, SISP goals are aligned with business goals but suggested solutions are very often far from real business needs, SISP is not fully followed as departments with their miniature IS/IT functions retain their own control on IS initiatives);
- **Sustainable Planning** (plans are independent of any particular information technology, thus are more strategic, fully followed, emphasis is on integration, and coordination, they are driven by business needs, planning review meetings and evaluation of outcomes are in place, but they are event-driven and episodic rather than continuous);
- **Adaptable Planning** (plans are fully strategic as they utilise the IS capability for gaining competitive advantage, they are dynamically synchronised with business needs, the quality of SISP content is

enhanced by undertaking scenario planning, plan optimisation, focus on quality, monitoring, and control are continuous processes, very often the focus is on horizontal integration to achieve cohesion between partner organisations to sustain competitive advantage).

The main characteristic of the developed model is the model robustness. The proposed model can be applied to all types and sizes of organisations. As this model was operationalised through the assessment model (discussed in Chapter 4 and summarised in the next section) its validity is tested by empirical data.

While the SISP theory supported the five-stage SISP maturity model, the empirical data rejected this model in the Australian environment. This still does not mean that the model in its entirety may not be applicable in another environment as the model was based on the SISP literature collected from different geographical areas. The empirical data did not support the Rudimentary and Ineffectual planning levels.

7.2.2.2 The Model for Assessing SISP Evolution

The model for assessing the evolution of SISP is depicted in Figure 4.2. To develop this model, a thorough investigation of the SISP structure and SISP behaviour was undertaken to define the criteria for assessment. All important factors that have an influence on successful planning were considered.

The model for assessing SISP maturity was established as a third-order system. The SISP literature defined SISP as a second-order system, where the first order constructs are identified as alignment, analysis, cooperation, and improvement in capabilities and a second-order construct was SISP success (Segars and Grover, 1998). To assess SISP, this study introduced third-order criteria to yield fine assessment of SISP.

The first-order SISP assessment criteria (subcriteria) are identified as: Form and Content, Collaboration, Policies, Stakeholders' Designation, Knowledge Bank, Technology, Time Dimension, and Viability. The second-order criteria are fine grained behavioural characteristics of SISP, such as effectiveness, efficiency, and manoeuvrability. The third-order criterion is overall SISP success.

The same criteria and subcriteria were used for the assessment of all SISP maturity stages. AHP/ANP as described in Chapter3 and 4 was utilised to obtain the relative ranking of each SISP stage by judging the importance of the SISP structure elements with respect to the relevant criteria for every maturity stage. The ratings scale used to judge (define) the stages of SISP maturity is shown in Table 3.2.

The study suggests that if an organisation obtains higher scores on eight dimensions, it achieves a higher maturity level of SISP. The results obtained are summarised in Table 4.20 and graphically presented in Figure 4.11. More informative assessment results are presented in Table 4.21 and Figure 4.12. These tables and figures and the related discussion (Chapter 4) demonstrated the following:

- The results obtained were in accordance with theoretical expectations;
- The weights obtained for the SISP maturity levels were in logical order of importance;
- The emerged priorities of the SISP dimensions are of significant importance to SISP theory and practice.

The implications of this model for SISP theory and SISP practice are discussed in the next sections of this chapter.

To summarise, the model for assessment of SISP maturity, together with the model for SISP evolution, answered the main research question by demonstrating how the maturity level of SISP is modelled. The development of these models achieved multiple research aims:

- The existing SISP theory is extended and many insights into SISP processes are provided;
- The complex and implicit meaning of the concept of SISP maturity is overcome by differentiating SISP maturity from IT departmental maturity;
- A novel approach to SISP maturity definition is provided;
- A successful application of the Integral Engineering approach enabled reducing SISP complexity by simplifying it to a natural and structured way. The end result was a single overall measure for each of the SISP maturity levels as well as weighted criteria involved in the assessment process;
- A measuring instrument is developed

The main characteristics of the developed models are:

- Their robustness- they can be applied to any type and size of organisations;
- The use of ratio scales that enable comparative measurements of different intangible qualities;
- The use of logical ways of thinking and intuition, experience and knowledge to provide judgments;
- The assessment model is based on technology that provides a user-friendly interface and generates a comprehensive report;
- The assessment model is flexible, addition/deletion of constructs is not a difficult task;
- The model is adaptable; it can easily accommodate contemporary changes in criteria prioritisation;
- The model enables testing the sensitivity of the outcomes to whatever kinds of change may be anticipated; and
- The model does not provide a description of the practices the organization should follow while assessing SISP.

7.2.3 Assessment of SISP Maturity in Australian Organisations

A selection of the items of the measuring instrument was based on the work of various SISP researchers. Most of them were validated within their original studies. However, this study has compiled a more complete construct structure for SISP assessment than any study to date.

To be able to use the dataset from the survey, the absolute rating model combined with benchmarking was established. As described in Chapter 3, this model used the elements prioritised during the relative ranking. Measurement scales (from the measuring instrument) are attached to the elements and then the data from the survey is transferred into the model to assess each surveyed organization against the benchmark. The benchmark was needed as the organisations are not exhaustive and there may be others that are better or worse. The benchmark organisation was established by assignment of the best score on every criterion.

The organisations that performed regular SISP are mainly at the Sustainable level of planning (52%). Attainable planning is achieved in 30% organisations, while the highest level of SISP maturity is achieved only in 18% of the surveyed population. When all organisations which have attempted some form of SISP planning are taken into account, those percentages are different: level five was achieved at the 4.6%; level 4 and 3 at the 50.4% and 45% respectively.

This is a very important finding of this study. These percentages are the result of very tedious and exhausted research based on scientific methods to be able to confidently assign a single measure for SISP achievement in Australia. Many behind the scenes works are not reported in this study to keep the content at an acceptable level. Therefore, the ambitious goal to find the degree of SISP maturity in Australian organizations (the secondary research question) is achieved and the following objectives are fulfilled:

- The developed models are applied to assess SISP maturity across Australian organizations;
- The models can be used by organisation to evaluate the maturity of their SISP and define improvements through goal refinement;
- The suggested approach can significantly improve the time needed to assess the SISP processes and consequently can improve planning/re-planning duration which can be detrimental to SISP success;
- The models use scales that enable measurement of tangibles and intangibles; and
- The usage of models can provide feedforward information for IS planners to make their plans more strategic or provide feedback information for decision-makers to take corrective actions in order to reduce the severity of problems and thus realize the potential contribution of SISP to organizations.

7.2.4 Discussion –Revisiting the SISP Literature

The aim of this section is to compare the empirical findings from Chapter 6 with the findings of the key references discussed in Chapter 2. A comparison of relationships between SISP constructs are not presented as the relationships are discussed in the following sections. Also, only explicitly comparable findings are discussed. To add clarity in the presentation a tabular expression of the key points is used and shown in Table 7.1

Table 7.1 A summary of the comparable findings in the SISP literature review and data analysis

Discussion Point	**SISP Literature Reference**	**SISP Literature Findings**	**This Study Findings**	**Comment** (related to findings in present study)
SISP Success - degree of satisfaction with the strategic IS plan	Lederer & Sethi, 1999); Groznik & Kovacic 2000; Teo et al., 1997 Earl, 1990; Galliers, 1987.	32% 98% 94% 76% 71%	42.7% (overall)	This rate is higher (76.47%) for organisations who perform regular SISP, but still should be considered as low.
SISP Objectives Rank Order	Earl, 1993	(1) Aligning IS with business needs (2) Seek competitive advantage from IT (3) Gain top management commitment (4) Forecast IS resource requirement (5)Establish Technology Path and Policies	(1) Enable existing business strategies (2) Improve customer satisfaction (3) Competitive advantage through superior capabilities (4) Create new business strategies (5) Provide advantage such as lower costs or product differentiation	IT is seen as a business enabler, thus the strategic advantage associated with IT comes as a secondary objective
Benefits of SISP Rank Order	Teo et al., 1997	(1) Improved productivity (2) Improved internal coordination (3) Efficient and effective management of SISP resources (4) Improved competitive position (5) Greater ability to meet changes in the industry	(1) Improved internal communication (2) Improved productivity (3) Enabled existing business strategies (4) Provided better understanding of IT/IS potential (5) Quality of decisions support enhanced	The highly positioned objectives are not materialised as top benefits, in particular the benefits of gaining competitive advantages by SISP
Key Issues in IT Management	Palvia & Palvia, 2003 (Australia, 1993 survey)	(1) Improving Strategic Planning (2) Building responsive IT infrastructure (3) Aligning IT/IS and Corporate Goals (4) Promoting effectiveness of the data resource (5) Using IS for competitive advantage	(1)Aligning IT strategy with business strategy (2) Meeting business and user needs (3) Security issues (4) Gaining top management commitment (5) Maintaining service continuity	The difference in the key issues indicates the importance of continuous scanning of SISP practices to discover emerging issues
SISP Problems Rank Order	No1, Lederer & Sethi, 1992; No2, Cerpa & Vener, 1998.	Misalignment of SISP and business goals	(1) Lack of commitment from senior management	The previously third-ranked 'problem with resources' now

Discussion Point	SISP Literature Reference	SISP Literature Findings	This Study Findings	Comment (related to findings in present study)
	No.2, Yeo, 2002; No3, Cerpa & Vener, 1998; No2, Flynn & Goleniewska, 1993; No3, Lederer & Sethi, 1992; No2, Earl, 1993; No1, Teo & Ang, 2001.	Lack of management commitment and involvement	(2) Budget limitations (3) Lack of senior management involvement (4) IS management is not part of the corporate planning process (5) Lack of alignment with business objectives (6) Inadequate framework used for setting IT investment priorities (7) Inappropriate planning horizons (8) No learning from past experience (9) No adequate knowledge and expertise (10) No motivation for the initialisation of SISP reviews	occupies a much lower position; it is now at the ninth position
	No.1,4, Yeo, 2002; No4, Cerpa & Vener, 1998; No1, Flynn & Goleniewska, 1993; No2,3, Wilson, 1989; No2, Ward & Griffiths, 1996; No1, Earl, 1993; No3,4, Teo & Ang, 2001.	Problems with resources (recruiting & education)		
	No.5, Yeo, 2002; No1, Cerpa & Vener, 1998; No2, Wilson, 1989; No4,6, Ward & Griffiths, 1996.	Organisational politics and policies		
	No.2, Yeo, 2002; No1,2,3, Lederer & Sethi, 1992; No5, Teo & Ang, 2001.	Quality of the plan inadequate		
	No.1, Yeo, 2002; No2, Cerpa & Vener, 1998; No3, Flynn & Goleniewska, 1993; No1, Lederer & Sethi, 1992; No3, Earl, 1993.	Inappropriate planning horizons		
	No3, Cerpa & Vener, 1998; No 8,11, Ward & Griffiths, 1996.	Rapid change of technology		
	No.3, Yeo, 2002; No2, Cerpa & Vener, 1998; No4, Flynn & Goleniewska, 1993; No10, Ward & Griffiths, 1996; No4, Earl, 1993; No2, Teo & Ang,	Intercommunication		

Discussion Point	**SISP Literature Reference**	**SISP Literature Findings**	**This Study Findings**	**Comment** (related to findings in present study)
	2001.			
	No.3, Yeo, 2002; No3, Lederer & Sethi, 1992.	Inadequate project risk analysis		
	No.5, Yeo, 2002; No1, Wilson, 1989; No1, Ward & Griffiths, 1996.	Measuring benefits		
Alignment between content of the business and IS plans SISP is performed in response to business planning SISP is part of business planning SISP is a basis for business planning SISP is performed in isolation from business planning Strength of Connection (alignment)	Galliers, 1987 (Australia 1985 survey)	27.9% 34.4% 4.9% 32.8% 8% Inextricably tied 48% Somewhat linked 35% Tenuously linked 8% Totally isolated	36.8% 42.5% 39.1% 11.6% 37.9% Inextricably tied 46% Somewhat linked 17.2% Tenuously linked 1.1% Totally isolated	The comparative results from the other studies (not shown in this table) are worrying. The opposite direction, alignment between SISP and business planning was confirmed in an average of 54.6% cases. The highest percentage (71.2%) was scored for 'The IS Plan supports the business strategies' item.
Communication	Teo and Ang, 2001	A major problem in launching IS planning effort (61.1%)	As result only 36.8% saw IS/IT as adding value to the business, 52.9% saw IS/IT as a business enabler, and only 20.7% thought of IT/IS as a business driver.	Also the high score of 'intangible benefits are not presented to the sponsor' indicate a communication problem
Approaches Rank Order (used/success)	Earl, 2000	No1/no1 Organisational No3/No2 Business led No3/no3 Technological No2/No4 Administrative No4/No4 Method driven	No4/No1 Method driven no2/No2 Organisational No1/No3 Business led No3/No3 Technological No5/No4 Administrative	Only 55.2% of respondents are satisfied with the current approach

Discussion Point	**SISP Literature Reference**	**SISP Literature Findings**	**This Study Findings**	**Comment** (related to findings in present study)
Methodologie s	Premkumar and King, 1991	Information Engineering (12%), Business Systems Planning (8) CSF (6%) Value Chain (6%)	Information Systems Planning (9%) SWOT analysis (8.5) Technology assessment IS infrastructure review (7%) Business Systems Planning (6%) Staged Approach (5%)	This study: methodologies 'used' and to 'some degree used' is 26 % and 74% not used. The most successful are: (1)Method_1 (2)Fuzzy_Cog nitive_Maps (3)Information _Engineering (4)Ends_Mean s_Analysis (5)Information Engineering WorkBench IEW
Planning styles Rank Order (used)	Spremic & Strugar, 2002	(1) Bottom-up (9.8%), (2) Top-down (29.4) (3) Combination of the two (54.9)	(1) Bottom-up (35.77%), (2) Top-down (34.96%), (3) Combination of both (29.27%).	Inside_out is the most successful planning style
Source of expertise Rank order	Teo et al. (1997),	(1) software vendors (2) hardware vendors (3) books or periodicals (4) private consultants (5) government bodies (6) university consultant	(1) Internal resources (2) Consultants (3) books or periodicals (4) software vendors (5) hardware vendors (6) government bodies (7)university consultant	79.2% Internal resources 15.3% Consultants
The Key Models of SISP Evolution	Nolan, 1979 Pascale & Athos, 1981 Bhabuta, 1988 Hirschheim, Earl, Feeny & Lockett, 1988	Six-stage of 'growth' (Initiation, contagion, control, integration, data administration, maturity) Seven 'S's (Strategy, structure, systems, staff; style, skills, super-ordinate goals). (activities needed for an organisation to progress through IT stages of growth) Four phase strategic planning (Strategy formulation, information systems application, value system, manner of IT management practicing.) Three distinct phases (Delivery, Reorientation, Reorganisation)	Five-stage SISP evolution model Rudimentary Planning, Ineffectual Planning, Attainable Planning, Sustainable Planning, Adaptable Planning.	Empirical data confirmed only existence of ; Attainable, Sustainable, and Adaptable Planning levels.

Discussion Point	**SISP Literature Reference**	**SISP Literature Findings**	**This Study Findings**	**Comment** (related to findings in present study)
	Sutherland & Galliers, 1989	Six stages of IT growth (Ad hocracy, Starting the foundations, Centralised dictatorship, Democratic dialectic and cooperation, Entrepreneurial opportunity, Integrated harmonious relationships).		
	Earl, 1989	Five approaches as levels of organisational maturity (Technology Led, Method Driven, Administrative, Business Led, Organisation Led)		
	Smits & Poel, 1996	Five organisational phases of information strategy (Turbulence, orientation; consolidation; exploitation; tension).		
	Ward & Griffiths, 1998	Earl's approaches organised in five stages of organisational maturity with respect to IS planning (Stage 1- Technology Led with the main focus on IS/IT application mapping ; Stage 2 - Method Driven with the main focus on defining business needs; Stage 3 -Administrative which is concerned with detailed IS planning; Stage 4 -Business Led which main task was strategic/competitive advantage; Stage 5 - Organisation Led which is concerned with linkage to business strategy).		
	Ward & Peppard, 2002	Five stage evolutionary process (Stage1 – data processing planning; Stage 2 - top-down planning of IS/IT applications; Stage 3 – extensive 2-3 year plan;		

Discussion Point	**SISP Literature Reference**	**SISP Literature Findings**	**This Study Findings**	**Comment** (related to findings in present study)
		Stage 4- users are involved in planning (freedom to innovate); Stage 5 –IS/IT alignment with business strategy).		
	Galliers & Sutherland, 2003	Six stages of IT growth Extended Sutherland and Galliers (1989) framework by associating each stage with the Seven 'S's		
	Grover & Segars, 2005	Three SISP stages (Preliminary Stage, Evolving Stage, Mature Stage).		

7.2.5 Research Hypotheses

The model for SISP assessment and the methodology used provided a means for gaining more qualitative insights into the relationships of the factors influencing the SISP process. The ANP/AHP method allowed the assessment of relationships between any variables used in the model. However, these relationships are expressed as weighted priorities in matrix form. The exploration of these matrices allowed very fine analysis of relationships between variable, which was found to be too detailed for this study. Still, the aim of this study to bring to the surface the normally hidden content of the relationship on an item level was achieved by empirical testing of the existence of those relationships using standard statistical procedures. The assessment of these relationships has gone beyond anything revealed by SISP studies to date. Note that causality is beyond the scope of this study. Also, in many instances the research observed that the synergetic effect of the variables combined together was higher than if the variables are assessed individually or simply added up.

The study formally tested fourteen hypotheses. These hypotheses and their results are summarised in the concluding section of Chapter 6. All hypotheses are supported except for H5 for which this study could not find any support and H6 which was partially supported.

However, during data analysis, the study tested a significant number of relationships which could all take a form of formal hypothesis. As those relationships have not been envisaged during the SISP literature review, they are not formally converted to hypotheses. The strategic contribution of the results of hypotheses testing is summarised in the following sections.

7.3 Implications for SISP Theory

One of the main contributions to the SISP theory is proving the need to extend the SISP theory by researching the evolution of strategic IS planning process per se, i.e. segregation of SISP maturity from IS/IT and an organisation's maturity. The stage models in the SISP literature prior to the commencement of this research comprised of four, five, six and even beyond stage six (Smits and Poel, 1996) models. This study empirically confirmed the current existence of only three levels of SISP maturity. This result is supported by a very recent study of Grover and Segars (2005). Thus, the contribution to the SISP theory is twofold: the evolving nature of SISP is confirmed and the current stages of evolutions are empirically discovered.

The study has also offered a fresh way of defining SISP maturity, and the SISP assessment criteria. The assessment of SISP was based on three main criteria: Effectiveness, Efficiency and Manoeuvrability. The introduction of Manoeuvrability as criteria which reflects the dynamic side of SISP and proving that dimension have more influence on SISP success than Efficiency is a major contribution to SISP theory and practice.

The validity of the models was tested methodically. Statistical methods like SEM confirmed the adequacy of the establishment of the SISP assessment model as a third-order system. Providing the SISP assessment model with prioritised criteria and subcriteria against each SISP maturity stages is an enormous contribution to the SISP theory. Knowing what is more and what is less important for SISP success is of paramount value. As these findings are even more important for SISP practitioners, they are discussed in the next section.

This research has addressed a recent call within SISP literature for a more holistic approach to SISP and for the application of new methodologies. The study contributed to the SISP body of knowledge by introducing into this field the analytic thinking technique which combines the deductive (focus on the parts) and the system approach (focus on a system as a whole). The applied Integral SISP Engineering approach enabled identifying, understanding and assessing the interactions of the SISP system as a whole. The methodology used provided a way of gaining qualitative insights into the relationships of the factors influencing the SISP process and acted as a tool for the evaluation of the SISP planning efforts.

Also, SISP assessment is enhanced by demonstrating the capability of the ANP/AHP methods to reduce SISP complexity in natural and structural ways and to overcome the problem of measurement scales. A capability to simultaneously use any type of scale (for example interval and ordinal scales) is of a great importance as different scales are needed for the investigation of the SISP constructs. This is a unique attempt in SISP theory to utilise mathematical theory to elicit judgements and derive ratio scales.This study is a pioneering work in this area. It opens the way for SISP thinking beyond the conventional approaches.

An important contribution to SISP theory is the empirical confirmation of prior works and the identification of new relationships. In particular, this study attempted to understand SISP efforts in small and medium organisations as the majority of SISP studies explore SISP only in large organisations. Therefore, in addition to contributions relating to conceptual modelling and to the new methodology of measuring SISP success, the following contributions have been made to understand what influences SISP and leads to SISP success:

Relations: SISP maturity

- Identified: As SISP evolves towards higher maturity levels, the level of planning success will increase (H13, confirmed).
- Confirmed: the existence of a relationship between SISP objectives and SISP maturity levels.
- Identified: the existence of a relationship between SISP maturity and organisational size.
- Identified: as SISP evolves towards higher maturity levels, the level of SISP benefits will increase (H1, confirmed).
- Identified: the key issues in IT management are significantly related to the SISP maturity levels.
- Identified: the importance of SISP formulation failures is significantly related to the SISP maturity levels.

- Identified: the importance of SISP implementation failures is significantly related to the SISP maturity levels.
- Identified: as the level of SISP maturity increases, the alignment between the strategic information systems plan and the business plan increases (H4, confirmed).
- Identified: there is a strong relationship between the strengths of linkage between SISP and business planning and SISP maturity levels.
- Identified: SISP communication dimension is significantly related to SISP maturity levels.
- Identified: As the level of SISP maturity increases, the need for formal (packaged) methodologies decreases (H3, partially confirmed).
- Identified: the highest level of SISP maturity tends to decrease the use of formal (packaged) methodologies (H3a, confirmed).
- Identified: The more mature SISP is, the more the impact of external environmental factors are considered (H11, confirmed).
- Identified: there is a strong relationship between the SISP focus (control and creativity orientation) and the SISP maturity levels.
- Identified: various policies have different importance for the different SISP maturity levels.
- Confirmed: there is a strong relationship between knowledge and knowledge sharing across all SISP maturity stages.
- Identified: IS management commitment starts to decrease in the high maturity stage of SISP.
- Identified: as SISP maturity increases the level of deployment of technologies (which help efficient production of SISP) increases.
- Identified: there is a relationship between scenario planning and SISP maturity.
- Identified: regular change reviews are related to SISP maturity.
- Identified: measuring the lost/gained opportunities is related to SISP maturity.
- Identified: there is a relationship between the planning horizon and SISP maturity.
- Identified: SISP measurement objectives are associated with SISP maturity.

- Identified: The more mature SISP is, the more satisfaction is obtained with the accomplishment of SISP measurement objectives (H10, confirmed).

Relations: SISP success

- Confirmed: the existence of a formal approach to SISP planning will have a favourable effect on the overall success of SISP (H2, confirmed).
- Confirmed: different SISP approaches are differently associated with SISP success. SISP approaches are evolving and often use combinations of various approaches that make the borders and boundary lines that distinguish approaches very blurred.
- Confirmed: SISP objectives influence SISP approaches.
- Confirmed: the use of methodologies is positively related to SISP success.
- Confirmed: the quality of SISP content is positively related to SISP success.
- Identified: there is a strong relationship between the SISP focus (control and creativity orientation) and SISP success.
- Identified: policy dimension (internal and external policies) is a significant predictor for SISP success.
- Identified: as awareness towards cultural issues and other causes of resistance increases, SISP success increases (H7, confirmed).
- Confirmed: a more skilful SISP team produces more successful SISP (H8, confirmed).
- Confirmed: there is a strong relationship between knowledge and knowledge sharing and SISP success.
- Confirmed: As the commitment of senior management towards SISP increases, SISP success increases (H6, partially confirmed).
- Confirmed: As the commitment of senior management increases, SISP success increases until it (success) reaches a maximum; as the commitment of senior management continues to increase, SISP success decreases (H6a, confirmed).
- Identified: If SISP is initiated by a senior business manager and an IS management coalition, it will be more successful (H5, rejected).
- Identified: there is a relationship between SISP success and technologies (which help the efficient production of SISP).

- Identified: a firm's immediate environmental factors have greater influence on SISP success than general external environmental factors (H12, confirmed).
- Identified: regular change reviews will positively influence the success of SISP (H9, confirmed).
- Identified: scenario planning is not related to SISP success.
- Identified: measuring the lost/gained opportunities is related to SISP success.
- Identified: there is a relationship between the planning horizon and SISP success.
- Confirmed: measurement of SISP performance is related to SISP success.
- Identified: there is no relationship between the duration of SISP and SISP success.
- Identified: SISP measurement objectives are associated with SISP success.

Relations: Size of on Organisation

- Identified: a significant number of small and medium size companies have IT function, critical to do business, have adequate IT skills, allocate a significant budget to keep up with IT/IS demands but see IT as a necessary overhead to support day to day business and not as a function which adds to the value of business. Therefore, they do not perform SISP.
- Confirmed: the size of the organisation in terms of number of employees is a significant antecedent for conducting SISP.
- Identified: there is no relationship between IS/IT organisational structure and conducting SISP. A weak and negative relationship is observed only in a case where IS/IT is distributed and is critical to the business.
- Identified: there is a relationship between organisation size and SISP objectives but only for a set of objectives and not for individual objectives.
- Identified: there is no relationship between SISP objectives and IT structure.
- Identified: the larger the organisation, the greater the level of SISP maturity (H14, supported).
- Identified: there is no relationship between the cause of SISP formulation failure and the size of an organization.
- Identified: there is no relationship between the cause of SISP implementation failure and the size of an organization.

- Identified: there is a strong relationship between the strengths of the linkage between SISP and business planning and the size of an organisation.
- Identified: there is no relationship between the selection of a SISP approach and the company size.
- Identified: there is a relationship between SISP content and company size.
- Identified: there is a strong relationship between the SISP focus (control and creativity orientation) and company size.
- Identified: there is a relationship between SISP policy dimension (internal policies) and company size.
- Confirmed: there is a relationship between knowledge and knowledge sharing and company size.
- Identified: there is a relationship between managerial commitment and company size.
- Identified: there is a relationship between participation (managerial and users) and company size.
- Identified: as the size of a company increases the level of deployment of technologies (which help efficient production of SISP) increases.
- Identified: regular change reviews are related to company size.
- Identified: there is no a relationship between measuring the lost/gained opportunities and company size.
- Identified: there is a relationship between the planning horizon and company size.
- Identified: there is no a relationship between the measurement of SISP performance and company size for individual measurements but as a set of measurements.
- Identified: there is no a relationship between the SISP measurement objectives and company size for individual objectives but as a set of objectives.

7.4 Implications for SISP Practice

The development of the SISP assessment model is governed by the aim of providing a model which is helpful for practitioners. All efforts were made so that the model is not too conceptual in nature and that the measuring instrument is practical for use. Also, with respect to industrial needs, existing measurement approaches lack both accuracy and reliability. This research gives special attention to how measurements influence the success of SISP and contribute to the overall assessment of SISP maturity. The content of the relationships emerged during empirical analysis and is presented on an item level, to reveal their relevance for practitioners.

Therefore, the SISP assessment model and the measuring instrument provided in this study can be used as a tool for organisations to evaluate their SISP practices. The model has weighted criteria which can help an organisation position itself in terms of stage of SISP maturity. That can help in the identification of areas which may need improvement, thus providing support for SISP planners to rationalise and refine the process of planning, to move to a higher maturity level or to consolidate the current level.

The SISP evaluation in Australian organisations revealed significant implications for SISP practice. The most important finding is that Australian organisations did not consider the strategic relevance of IT as the key objective. IT/IS is seen as a business enabler, thus the strategic advantage associated with IT comes as a secondary objective. Consequently, the current SISP plans lack strategic dimension. The IT plan should not be called Strategic IS plan if it does not offer solutions to the strategic utilization of IT. This study found that the strategic dimension of SISP should be based on enhancing the decision-making processes rather than looking at how SISP can increase competitiveness (focus on control orientation instead on creativity).

Empirical data showed that Australian organisations are taking a more ‘tactical’ way of producing SISP plans as IT projects are embedded in SISP plans. Also, a one year planning horizon makes those plans more tactical than strategic. The difference of success rate between the planning horizons is not so significant. In any case, one-year strategic plans look the least successful way of planning. This study found that 3 to 5 year planning can enhance the strategic dimension of SISP. These planning horizons can be supported by regular change reviews to catch up with the ever changing environment. The empirical data confirmed that irregular change reviews are not associated with SISP success, thus regular change reviews can ensure that an organisation is on the right track, will not miss opportunities and could avoid threats.

The other key points of SISP assessment for practitioners are:

- The study confirmed that the existence of a formal approach to SISP planning is significantly related to SISP success. The use of combinations of various approaches is more successful than the application of a single approach. However, the difference in success achieved between various approaches is not so significant. The least successful is the Administrative approach. The most used Business-Led approach reflects business leading IS while it should be the other way round. The most used combination is the Organisational and Business Led approach. This study found that a combination of Organisational, Business Led and Method Driven approaches could be the most successful way of conducting SISP.
- The most popular methodologies (Information Systems Planning, SWOT analysis) are not the most successful ones. Emerging methodologies such as Fuzzy Cognitive Maps and Information Engineering which are result oriented (impact methodologies) could improve the success prospect of SISP.
- Alignment between SISP plans and business plans in both directions is significantly related to SISP success. These links have long been recognised. However, the empirical data shows that this alignment is still far from a satisfactory level. Greater efforts from SISP practitioners are especially needed to influence the stronger alignment between the business and SISP plans.
- SISP practitioners should be aware that not only coordination and communication between SISP participants is important, but collaboration with the rest of the organisation is of significant importance. The SISP plan needs to secure genuine organisational support to avoid sitting on a shelf and collecting dust.
- Despite knowing that management commitment is important for SISP success, managerial commitment in Australian SISP practice is not so pronounced. However, there are situations where over-commitment of CIOs and senior business management is detected as more commitment did not correspond to more success in SISP. In those cases, over commitment can lead to excessive planning and may impede the achievement of SISP. Also, obtaining a management support in the implementation phase is of more importance than at the start of SISP.
- Current SISP success is not influenced by users and technical IT personnel participation. However, the SISP maturity model indicated a strong correlation with wider SISP participation. Thus, more participative SISP should be promoted, especially in small and medium sized companies.

- It is important to have the top executive champion SISP. Success of SISP can be as much as doubled if it is initiated and championed by a CIO rather than a CEO. SISP initiated by top management is more strongly related with success than if initiated by a senior business manager and IS management coalition.
- SISP is more successful if its content addresses socio-technical issues, rather than only technical issues. A proactive dimension of SISP content (scenario and contingency planning) can enhance the strategic dimension of SISP. Practitioners should be aware that more comprehensive SISP (extensive analysis of internal and external environment) could be necessary to ensure the quality dimension of SISP which will lead to a more responsive SISP to environmental uncertainty.
- An intuitive conclusion that SISP is more successful if the SISP team has adequate knowledge is formally confirmed. The ability of strategic thinking and knowledge of business objectives should be the key characteristics for SISP planners. The study confirmed that technical skills as Programmer, Database administrator, IS/IT trainer, Technical support/systems programmer, and General IT consultant are not related to SISP success. Practitioners should be aware that knowledge sharing, through learning and change reviews is strongly associated with SISP success and that SISP is most successful if it is based on internal resources.
- SISP efficiency is positively related with technologies which can help more efficient production of SISP. Therefore, management should ensure the existence of infrastructure which enables efficient gathering and analysis of data, and improves communication.
- The SISP process itself can be very costly and the efficiency of SISP processes should be measured. However, a measurement of SISP outcomes like business value delivered and customer satisfaction with the deliverables is of critical importance. The current level of measurement is very low. The empirical data confirmed a positive influence of measurements on SISP success. Thus, practitioners should be encouraged to undertake more measurements of SISP processes.

7.5 Limitations of the Research

Throughout this study specific limitations are highlighted. Here is a summary of limitations which inherently apply to this type of research.

The Research Design and Methodology

Despite a significant number of SISP studies undertaken in the past, this is the first study to develop an 'ideal' SISP assessment model and to measure SISP maturity using a wide survey. The proposed models are a step forward to the ultimate assessment of SISP maturity. This is an ambitious goal that raises the question of the research manageability. Also, such an endeavour contains some inherent limitations; it is not possible to cover all aspects of this complex issue in great detail. The study acknowledged limitations related to the 'robustness' of the models. The choice of the methodology which breaks new ground is a special challenge for this research. The novelty of this approach is a matter for caution until future research confirms (modify or reject) the findings obtained by following this research paradigm.

The original intention of this research was to structure this thesis as a longitudinal study to fully capture the dynamic aspects of SISP. The intention was to collect data two years apart. However, during the literature review it was discovered that the period of two years is not long enough to capture a significant change in the SISP process and that approximately five to ten years would be a more appropriate time difference between data collection. This study could not afford such a long research horizon. As the developed models for SISP assessment and measurement are based on a 'dynamic framework' it would be more appropriate to have two samples of data.

The Constructs and the Measuring Instrument

All efforts are made to compile the best constructs upon which the models are based by searching, analysing and cross checking various publications. The generally high levels of consistency between different studies are significant and they add credibility to both the sets of findings, and consequently their implications are likely to be more general. However, the lack of consistency among studies is still evident and can cause erroneous conclusions regarding the selection of appropriate assessment criteria, constructs and the judgement of the importance of the constructs. We acknowledge that some constructs found in prior research may not be subject to rigorous validation or their use may be outdated due to the ever changing SISP environment.

The overall problem is that a large degree of subjectivity is involved in the measurement approach and subjective judgements on 'soft' data lack specific metrics. Also, the inconsistencies related to the relative measurements can lead to the erroneous rating of the influencing factors. This research indicates and measures the inconsistency in judgement, which can be used as an indication as to where an improvement is possible or where a better understanding of the interactions among factors is needed.

While every effort was made to ensure the quality of information used in this research through mechanisms such as surveying a large number of various sources and cross checking between them, in some instances the availability of the data was limited by a lack of information (such as measurement scales).

The measuring instrument can bear some inherent limitations as it relies on one person’s (mainly IT executive) knowledge and ability to accurately convey the SISP currency into the questionnaire. Hence, the use of perceptual measures from a single respondent could result in potential subjective judgements.

The Results Interpretation and Presentation

In some instances the underlying assumptions in statistical methods can affect their validity and effectiveness. Qualitative data cannot be directly represented and statistical approaches are limited in their ability to evaluate that type of data. Also, the result interpretation is influenced by the researcher’s cognition and experience. The results presentation relies on the researcher alone, which could be a limiting factor due to the researcher’s ability to communicate and present the complexity of research.

7.6 Suggestions for Future Research

A dynamic dimension of the model can be achieved in two different ways when using the AHP. The first way is to provide (static) judgements at various time intervals and generate trajectories as functions of time. The other way is to generate time dependant judgement matrices. This way involves extensive use of polynomial equations and it is technically very difficult to obtain results if the order of the matrix is more than four. This research suggests using time snapshots to capture dynamics (i.e. change in judgements about criteria, adding or dropping the criteria, etc.). Therefore, further improvement of the dynamic dimension of the development model is suggested as a future area of investigation.

ANP/AHP is a powerful framework for providing an effective way of prioritising criteria for SISP assessment. Further research in adapting the tools based on this framework specifically for the assessment and measurement could extend the use of the tools for proactive and reactive (feedforward and feedback) control of SISP processes.

The robustness and generalizability were, among others, criteria for the development of the SISP assessment model. Consequently, the model is not fine tuned for any specific type of organisations. Further studies purposely associated with different types of organisations, for example with the education or government organizations or the production-base and commercial environments would enhance the model. That would allow the model to be extended into fine granularity and greater comprehensiveness.

This study did not investigate causality of the SISP relationships. This task could perhaps be attempted on the SISP subsystems level or case study level as this type of investigation would require enormous time and effort. The development of SISP construct measures is an ongoing research task as SISP is a live, dynamic process, where today's important SISP dimensions may not be relevant tomorrow.

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APPENDICES

Appendix A

Table 0.1 The Literature Review: SISP Constructs

Researcher	Researched area	Construct investigated	Dimensions	Variables
Ramanujam and Venkatraman (1987)	Planning characteristics and Planning Effectiveness	Planning System	Use of planning techniques; Attention to internal facets; Attention to external facets; Functional coverage and integration; Resources provided for the planning; Organisational resistance to planning.	
		Planning Effectiveness	Assessed through fulfilment of objectives: Predicting future trends; Improving short-term performance; Improving long-term performance; Evaluating alternatives; Avoiding problem areas; Enhancing management developments.	
King (1988)	SISP model	IS Planning System	Information input; Resources; IS Planning Goals.	

		IS Planning Output		Quality of the output plan
		Business Performance		The fulfilment of objectives (planning effectiveness)
		External and Internal Standards		
	SISP assessment (based on above model)	Effectiveness Efficiency Performance	Effectiveness of IS planning; Relative Worth of the IS Planning System; Role and Impact of the IS Planning System; Performance of the IS Plans; Relative Worth of IS Strategy; Relative Efficiency of the IS Planning System; Adequacy of IS Planning Resources; Strategic Congruence.	
Galliers (1991)				
Earl (1993)	Successful SISP	Process		
		Method	Business led; Method-driven; Administrative; Technological; Organisational.	
		Implementation	Aligning IS with business goals; Seek competitive advantage from IT; Gain top management commitment; Forecast IS resources requirement;	

			Establish technology path and polices.	
Premkumar and King (1991)	Organizational characteristics and information systems planning (success)	Planning Process	Information input; Resources; Quality of the process.	
		Planning Output		Quality of the output plan
		Planning Outcome		The fulfilment of objectives (planning effectiveness)
Smits and Poe1(1996)	SISP in practice	Environment	Internal environment & External environment, (both with technological and organizational aspects).	
		Process	Mechanistic, problem driven, political, the methods and tools, the participants and their roles, the linkages with corporate strategy.	
		Form and content and standards (or policies)	Objectives or targets for the information function; Architectures, applications, technical and organizational, rules, and plans; Rules include guidelines.	
		Effects		Better information systems, better information, or better business results.
	Organizational phases	Turbulence Orientation Consolidation Exploitation Tension		
Lederer and Salmela (1996)	SISP model (input-output system view)	Planning Process	Internal Environment; External Environment;	Independent variables (Internal Environment, External Environment, Planning Resource

			Planning Resources.	
		Information Plan		
		Plan Implementation		Dependent variables (Planning Process, Information Plan, Plan Implementation, Alignment)
		Alignment		
Boyd and Reuning-Elliott (1998)	Key indicators of SISP (measurement model)		Mission statements; Trend analysis; Competitor analysis; Long-term and Annual goals; Action Plans; Ongoing evaluation.	
Segars, Grover and Teng (1998)	SISP dimensions and planning effectiveness	Definitional perspective	Scope; Perspective; Time frame; Level of abstraction.	
		Process Perspective	Comprehensiveness; Formalization; Focus; Flow; Consistency.	
Gottschalk (1999)	SISP Implementation predictors	SISP content and plan implementation	Resources needed for the implementation; User involvement during implementation; Analyses of the organisation; Anticipated changes in the external environment; Solutions to potential resistance during	

			the implementation; Implementation technology to be implemented; Project relevance to the business plan; Responsibility for the implementation;; Management support for the implementation; Clear presentation of implementation issues.	
Kearns and Lederer (2000)	Alignment and Competitive advantage	Alignment of the IS plan with the business		The IS plan reflects the business plan mission; The IS plan reflects the business plan goals; The IS Plan supports the business strategies; The IS Plan selects a portfolio that maximizes total business value; The IS plan recognizes external business environment forces; The IS plan reflects the business plan resource constraints;
		Use of IS-based resources for competitive advantage		To provide advantages as lower costs or product differentiation; To influence the buyer's decision to switch to our products; To leverage unique firm capabilities; To enable existing business strategies; To create new business strategies.
Basu et al.	SISP stakeholder and SISP		Organizational commitment;	

(2002)			Senior management involvement; Team involvement.	
		SISP success (achievement of objectives)		Align IT with business needs; Gain a competitive advantage from IT; Identify strategic applications; Increase top management commitment to IT; Improve communication about IT with users; Forecast IT resources requirements; Allocate IT resources; Development an information architecture; Increase the visibility of information technology in the organization.
Hartono et. al. (2003)	Key indicators that predict SISP implementation (measurement model)		Migration; Management Control; Study Focus; Team Member Selection Criteria; Needs.	Study Focus: The SISP study examined technological, environmental, and industry trends that may affect the organisation; The SISP study reviewed competitors' information technology; SISP planners participated in general, strategic business planning; The SISP study focused on how IT can add value, reduce costs, and create an advantage. Needs: The SISP study documented how well existing IS fit the needs of the organisation;

				The SISP study documented each functional area's information needs and those of any cross-function business processes.
Wang and Tai (2003)	Information systems planning effectiveness	Organizational Context	Formalisation; Centralisation; Future role of IS.	
		Planning Systems Dimensions	Organizational coalignment; Environmental assessment.	Resources committed to planning; Acceptance of planning; Implementation mechanisms; Integration mechanisms.
		IS planning systems effectiveness	Improvements in planning capability; Fulfilment of planning objectives.	Enhancing management development; Predicting future trends; Improving decision-making; Avoiding problem areas.
Powell and Powell (2004)	Scenario networks for SISP		Flexibility; Contingency.	
Lee and Pai (2003)	SISP success (organisational context and inter-group behaviour)	Inter-group Behaviour	Communication effectiveness; Task coordination; Conflict among stakeholders.	
		Organisational Context	Relationship between top managers and IS executives; Organisational Centralization; Maturity of information system function.	
		SISP Success	Effectiveness of the SISP process; Strategic IS planning alignment; Improvement of IS planning capability.	

Grover and Segars (2005)	Evolution stages of SISP	SISP Process	Planning comprehensiveness; Planning formalization; Planning focus; Planning flow; Planning consistency.	
		SISP Effectiveness	Planning alignment; Planning analysis; Planning cooperation; Planning capabilities; Planning contribution.	
		SISP Context	Environmental uncertainty; IT diffusion.	
	SISP evaluation stages (based on above model)	Preliminary Stage Evolving Stage Mature Stage		
Pai (2006)	Relationship between knowledge sharing and SISP	Knowledge sharing behaviour		Trust among stakeholders; CIO's knowledge; Sharing behaviour; Top management support for SISP; The quality of the ISSP process; Alignment of IS and business strategy.
Teo and King (1996)	Assessment of impact of integration of business and IS planning			Administrative integration Sequential Integration Reciprocal Integration Full integration
Sabherwal (1999)	Relationships between SISP sophistication and IS success	IS planning sophistication	IS planning behaviour;	

	(empirical assessment)	IS success Organisational integration Information technology capability	Knowledge overlaps	
Warr (2006)	Relationships between SISP dimensions	SISP Objectives SISP Approach SISP Context SISP Success	SISP Approach: SISP Philosophy, SISP Behaviours, SISP Agenda; SISP Context: Environment, Organisation Structure, IS Function Structure, Business Strategy Orientation IS Maturity.	
Byrd et al. (2006)	Impact of IS on operational cost	Low-level intangible IS/IT	IS Plan Quality System Quality Information Quality	Output variable: Benefits of use Organisational impact measured by total operational cost

Appendix B

Table 0.1 Primary Source for Definition and Judgments of Nodes for each Subcluster

Subcluster/Node	Primary Sources (to compile the elements and/or to judge the importance of the elements)
The degree of dependency on IT/IS infrastructure/applications IS/IT is distributed throughout the organisation, systems are NOT critical to the business and used solely to improve efficiency IS/IT is distributed throughout the organisation, systems ARE critical to the business IS/IT is centralised, systems are NOT critical to business operations IS/IT is centralised, systems ARE critical to business operations IS/IT function outsourced IS/IT function is perceived as making a value-added to the business IS/IT function is perceived d as business enabler	Ward & Griffiths (1998) Allen & Boynton (1991) Boar (2001)
The level of SISP planning More tactical than IS strategic planning IS plan address only technical issues IS plan address socio-technical issues IS Projects embedded in IS plan IT Projects embedded in business plan One-year formal SISP plans Three- year SISP plans Five -year SISP planning	Somogyi & Galliers (2003) Spremic & Strugar (2002) Smits et al. (2003) Palvia & Palvia (2003) Segars & Grover (1998) Finlay & Marples (2000) Nolan (1979)
Skills of participants who play the major roles in SISP The SISP team has adequate technical skills The SISP team has adequate project management skills The SISP team has adequate business skills The SISP team adopts an entrepreneurial marketing style The SISP team has strategically thinking capability The SISP team has knowledge about organizational objectives and goals	Finlay & Marples (2000) Hartono et al. (2003) Basu et al. (2002) Lederer & Salmela (1996) Lederer & Sethi (1996) Lambert & Peppard (2003) Flynn & Goleniewska (1993)
The SISP approach No specific SISP approach has been used Organizational Business led Administrative Method driven Technological Other	McBride, N. (1998) Doherty et al. (1999) Earl (1989, 1993, 2000) Ward & Griffiths (1998) Lederer & Salmela (1996) Flynn & Goleniewska (1993)
Methodologies and techniques used in conjunction with the chosen approach No specific method/technique has been used Bottom-up Top-down Combination of above Inside-out SWOT analysis Information Systems Planning Balanced Scored analysis Value Chain Analysis Method/1 Summit S & Summit D 4Front Information Engineering Work Bench IEW Information Engineering Business Systems Planning Business portfolio analysis Information Quality Analysis Business Information Analysis & Integration Technique	McBride (1998) Doherty et al. (1999) Ward & Griffiths (1998) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Segars & Grover (1998) Flynn & Goleniewska (1993)

Subcluster/Node	Primary Sources (to compile the elements and/or to judge the importance of the elements)
Business Information Characterization Study Ends/Means Analysis Staged Approach Executive Information Planning Information Systems Investment Strategy Resource Life Cycle Current portfolio evaluation Technology assessment and IS/IT infrastructure review Fuzzy Cognitive Maps Other methodology/technique	
Satisfaction with chosen methodology (techniques) Chosen SISP approach (and methodologies / techniques) is considered satisfactory We are developing new methodology/technique to tailor for our specific needs We are considering changing our SISP approach to improve SISP We have not been aware of the existence of different SISP methodologies Chosen SISP methodology (or lack of it) contributed to failure of SISP	Hartono et al. (2003) Lederer & Sethi (1992) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn and Goleniewska (1993)
The extent of participation in SISP CEO CIO IS management Senior business management Middle business management Users Systems analysts (developers) Computer systems programmer Computer operations personnel Vendors Consultant Stakeholders	Teo et al. (1997) Hartono et al. (2003) Basu et al. (2002) Jiang et al. (2001) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Lambert & Peppard (2003) Gottschalk (1998) Flynn & Goleniewska. (1993) Ruohonen (1991) Mitchell et al. (1997)
Person(s) who initiated strategic IS planning CEO CIO Senior business management IS management Middle management Senior business and IS management together IS and middle management together Senior business, IS, and middle management coalition IS staff planners Users and IS management together Users, business management and IS management coalition	Teo et al. (1997) Galliers & Leidner 2003 Spremic & Strugar (2002) Palvia & Palvia, (2003) Earl (2000) Lederer & Sethi (1996) Lambert & Peppard (2003) Flynn & Goleniewska (1993) Finlay & Marples (2000) Galliers (1991) Ruohonen (1991) Mitchell et al. (1997)
Degree of commitment toward the SISP formulation CEO CIO Senior business management Middle business management Only IS management	Galliers & Leidner (2003) Basu et al. (2002) Jiang et al. (2001) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Galliers (1991) Lambert & Peppard (2003) Gottschalk (1998) Flynn & Goleniewska (1993) Ruohonen (1991)
The sources for the expertise for SISP Internal resources Software vendors Computer hardware vendors	Teo et al. (1997) Hartono et al. (2003) Markus & Benjamin (2003) Palvia & Palvia (2003)

Subcluster/Node	**Primary Sources** (to compile the elements and/or to judge the importance of the elements)
Books or periodicals Consultants Government and semi-government bodies University consultants	Lederer & Sethi (1996) Lambert & Peppard (2003)
The SISP formulation undertaken studies Predictive study (what may affect IS/IT function in the future and how IS/IT function can respond to different proposed systems) Feed forward study (analysis of all important existing components such as hardware, software, resources, etc. which could be useful for a proposed new system) Feed back study (analysis of existing components such as hardware, software, resources, etc. which must change/replace) We perform tool-based, qualitative and quantitative scenario analysis to understand the consequences of a wide range of possible changes.	Powell & Powell (2004) Hartono et al. (2003) Spremic & Strugar (2002) Lederer & Salmela (1996) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993)
SISP implementation change reviews policy No reviews Tracking data is used for re-planning on a regular basis (at least quarterly) Once per six months Once per year Once in 2 years Once in 3 years Irregularly Change reviews are continues process	Hartono et al., (2003) Earl (1993) Palvia & Palvia (2003) Willcocks (2000) Flynn & Goleniewska (1993)
Experience with learning reviews No learning reviews We capture and share project's intellectual capital with all participants Learning on IS/IT impact on customers' behavior is shared Learning on technology applications are shared Learning on SISP experience are shared	Hartono et al. (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Lambert & Peppard (2003) Boar (2001)
Reasons for SISP planning/review IT executive change IT reorganization IT consolidation IT repositioning in the firm IT repositioning in the industry or society Senior business management Need to change production or production economics Competitive pressure SISP planning/review is continues process	Willcocks (2000) Earl (2000) Flynn & Goleniewska (1993) Boar (2001)
The importance of SISP objectives The need to acquire the new technology Provide advantage such as lower costs or product differentiation Influence the buyer's decision to switch to our products Leverage unique organization capabilities Enable existing business strategies Create new business strategies Make it more for our customer to change suppliers Establish electronic links with suppliers or customers Competitive advantage through superior capabilities Provide common database for decision making and planning Improve customer satisfaction Improve IS team performance The strategic use of information to gain competitive advantage Create barriers to keep competitors from entering our markets Coordination of IS functions with marketing, finance and human resource function	Basu et al. (2002) Hartono et al. (2003) Palvia & Palvia (2003) Earl (2000) Willcocks (2000) Flynn & Goleniewska (1993)
SISP promoting policy	Hartono et al. (2003)

Subcluster/Node	Primary Sources (to compile the elements and/or to judge the importance of the elements)
Innovative approach in solving customer problems Promoting new ideas and knowledge sharing Quick adaptation to external environmental changes Promoting cordial relationships between different departments to achieve business goals Lowering cultural gaps and other resistance and frictions Cost saving and reuse where appropriate Clear communications on all policies and responsibilities Balanced control with spontaneity	Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Reich & Benbasat (2003) Leidner (2003) Flynn & Goleniewska (1993)
The main focus of SISP planning Increase competitiveness Enhance strategic decision-making process Enhance efficiency of IT processes	Wilson (1989) Segars et al. (1998) Hartono et al. (2003) Earl (2000) Willcocks (2000) Reich & Benbasat (2003) Lambert & Peppard (2003) Flynn & Goleniewska (1993)
The most important SISP concerns Keeping up with technology Excessive spending on IS/IT (infrastructure, resources) Dealing with senior management Aligning IT strategy with business strategy Coping with internal environmental change Coping with external environmental change Gaining top management commitment Recruiting and retaining staff Maintaining service continuity Meeting business and user needs Infrastructure management Feasibility of strategy implementation Security issues Measuring IT's values Outsourcing of IS/IT	Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Lambert & Peppard (2003) Gottschalk (1998) Flynn & Goleniewska (1993) Cerpa & Verner (1998)
The extent of alignment of information system planning and business planning The IS plan reflects the business plan mission The IS plan reflects the business plan goals The IS Plan supports the business strategies The IS Plan selects a portfolio that maximizes total business value The IS plan recognizes external business environment forces The IS plan reflects the business plan resource constraints The business plan refers to the IS plan The business plan refers to specific IS applications The business plan refers to specific information technologies The business plan refers to value creation potential of information The business plan utilizes the strategic capability of IS The business plan contains reasonable expectations of IS Business and IS planning calendars are synchronized	Kearns & Lederer (2000) Spremic & Strugar (2002) Teo & King (1996) Reich & Benbasat (2003) Sabherwal, Hirschheim & Goles (2003) Smits et al. (2003) Earl (2000) Willcocks (2000) Flynn & Goleniewska (1993) Ward & Peppard (2002) Cerpa & Verner (1998) Mintzberg et al.(1998) Chan & Huff 1993 Galliers (1987)
The LINK between IS/IT planning and business planning Partners Integrated Weak link No link	Palvia & Palvia (2003) Tanaszi (2002) Willcocks (2000) Lambert & Peppard (2003) Teo & King (1996) Flynn & Goleniewska (1993)
Reasons for the SISP formulation failure Lack of alignment with business objectives Inadequate framework used for setting IT investment priorities	Finlay & Marples (2000) Lederer & Sethi (1992) Palvia & Palvia (2003)

Subcluster/Node	Primary Sources (to compile the elements and/or to judge the importance of the elements)
Inadequate methodology used No motivation for the initialisation of SISP reviews Unrealistic competitive advantage, mistaken impressions Budget limitations Inappropriate planning horizons The planning exercise is too expensive The planning exercise takes very long No review process No adequate knowledge and expertise No learning from past experience Intangible benefits are not presented to the sponsor Failure to consider the external business environment IS management is not part of the corporate planning process Lack of commitment from senior management Lack of senior management involvement Requires too much top management involvement Inappropriate measures or too much measurement Technology lagging behind needs Not fully investigated risk	Earl (2000) Cerpa & Verner (1998) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993) Wilson (1989)
<u>Reasons for the SISP implementation failure.</u> Lack of alignment with business objectives Inadequate framework used for setting IT investment priorities Inadequate methodology used No motivation for the initialisation of SISP Unrealistic competitive advantage, mistaken impressions Budget limitations Inappropriate planning horizons The planning exercise is too expensive The planning exercise takes very long No review process No adequate knowledge and expertise No learning from past experience Intangible benefits are not presented to the sponsor Failure to consider the external business environment IS management is not part of the corporate planning process Lack of commitment from senior management Lack of senior management involvement Requires too much top management involvement Inappropriate measures or too much measurement Technology lagging behind needs Rapid change of technology Cultural gap Not fully investigated risk	Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1992) Willcocks (2000) Lederer & Sethi (1999) Cerpa & Verner (1998) Wilson (1989) Gottschalk (1998) Flynn & Goleniewska (1993)
<u>External environment factors addressed in SISP</u> A political system and government polices The world economy with an emphasis on monetarism and free market economics Social issues Legal trends Limitations and new business opportunities imposed by ecological trends Technological barriers - coping with the pace of technological change Pressure groups & stakeholders Company's immediate competitive environment (suppliers and customers)	Hartono et al. (2003) Lederer & Salmela (1996) Palvia & Palvia (2003) Earl (2000) Lederer & Sethi (1996) Willcocks (2000) Flynn & Goleniewska (1993) Ward & Peppard (2002) Chi et al. (2005)
<u>Benefits of the SISP</u> Enhanced competitiveness such as lower costs or product differentiation Creates barriers to keep competitors from entering our markets Improved productivity Improved internal communication Greater ability to meet changes in the industry	Kearns & Lederer (2000) Cerpa & Verner (1998) Teo et al. (1997) Palvia & Palvia (2003) Lederer & Sethi (1996) Wilson (1989)

Subcluster/Node	**Primary Sources** (to compile the elements and/or to judge the importance of the elements)
Efficient and effective management of SISP resources Influenced the buyer's decision to switch to our products Enabled existing business strategies Established electronic links with suppliers or customers Helps with survival Improved quality in products/services Greater flexibility to meet external/internal environments Provided better understanding of IT/IS potential Quality of decisions support enhanced	
The extent of accomplishment and sustainability of SISP objectives Overall satisfaction with accomplishment of SISP objectives Satisfaction with SISP outputs Performance of SISP over the past one years Performance of SISP over the past two years Performance of SISP over the past five years	Wilson (1989) Earl (1993) Flynn & Goleniewska (1993) Cerpa & Verner (1998)
Measurement of achievement of SISP formulation and implementation objectives No formal SISP success measurement In-hose developed technique is used For every IS project a specific methodology/technique is developed/adapted Interviewing the 'champions' Using ad hoc procedure Return on investment (ROI) Balanced scorecard Value added Goal –Question-Metrics Case base reasoning Genetic programming Multi-objective, multi-criteria decision-making Boundary values; Return-on-management; Business process enhancement; Information economics; Experimental methods: Critical appraisal	Hartono et al. (2003) Palvia & Palvia (2003) Willcocks (2000)
When did measure of success/failure of SISP objectives occur We do not measure success/failure of the SISP Before the IS project starts (to have a ground) When the IS project finishes In post implementation phase Before, during implementation and after finish of the IS project Only for strategic projects Used for all projects Only against original objectives Against the current (reviewed) objectives	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003)
Experience with measurement No formal documents which outline purpose (like software quality), scope (selection of applications) and attributes (like functionality, reliability, code reusability) We do not have clearly defined work plan details (as who is responsible for gathering data, when the metrics will be collected and how the metrics will be reported) We have a problem with not financial measurement such as defining attribute's natural scale (like scale for user satisfaction, the service/product level expected) and confirming accuracy of the measuring instrument (to know measurement error or variability) We have a problem in understanding measurement theory and analysis of gathered data.	Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Mintzberg et al.(1998)

Subcluster/Node	**Primary Sources** (to compile the elements and/or to judge the importance of the elements)
We have developed measurement model but result we getting seem to be not reliable (such as measurement side effects when people make the numbers look better) We have clear understanding of what to measure, how to measure, how often to measure, who is responsible for the measurement, and how to interpret the measurement data and we are doing it satisfactorily. We employ automation tools for metrics collection, aggregation and analysis	
<u>What is measured during preparation or implementation of SISP</u> How efficient is SISP formulation process in comparison with the best-known (time and resources). How effective are we at doing SISP implementation What are the costs (as investment costs for the IT department) What are the costs (as cost per unit such as the cost of internet access per user, etc.) What is value of the lost/gained opportunity? Quality of deliverables The IT department performance Individual performance Duration of SISP processes Effort and cost of collecting measurement data Customer satisfaction with the deliverables Business value delivered (return on the investment in IT projects)	Hartono et al. (2003) Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Fitzgerald (1993) Boar (2001)
<u>Measurement objectives</u> Improve estimating for the future plans To gain top management support for the future projects To identify and communicate the best practices Improve control of IT/IS projects in terms of cost and time Increase man covering power	Basu et al. (2002) Palvia & Palvia (2003) Willcocks (2000) Willcocks & Lester (2003) Ward & Peppard (2002)
<u>The extent of accomplishment and sustainability of measurement objectives</u> Overall satisfaction with accomplishment of measurement objectives Satisfaction with measurement outputs Benefit of SISP over the past one years Benefit of SISP over the past two years Benefit of SISP over the past five years	Palvia & Palvia (2003) Willcocks (2000)
<u>Organization profile</u> High-Teck Innovation-driven Knowledge-intensive High performance e-business Electronic solutions integrator Product consultant (specialized in the customization of the products of a particular development firm No intention to trade electronically	Andersen (2001) Ward & Peppard (2002)
<u>IT/IS infrastructure/applications in place</u> Nanotechnology Neural networking Internet Intranet Extranet Wireless technology (Second generation) Wireless technology (Third generation) Local area networks (LAN) Wide area networks (WAN) Client/server network Peer-to-peer network Decision support systems Distributed databases Relational Database	Andersen (2001) Palvia & Palvia (2003) Willcocks (2000) Cerpa & Verner (1998)

Subcluster/Node	Primary Sources (to compile the elements and/or to judge the importance of the elements)
Data warehousing Data Mining Electronic Data Interchange (EDI) Executive Information Systems (EIS) Expert Systems (ES) Virtual reality systems Voice recognition systems Web based technology CASE technology 4GL (4th Generation language for end-user development) Multimedia - using high bandwidth networks Traditional separate data, text, imaging/graphics, voice and video Security & risk management infrastructure (firewalls, etc.) Application infrastructure is integrated Legacy applications are replaced by an integrated package Application infrastructure is stand-alone Object oriented development environment Bar-code readers	
The degree of dependency on IT/IS infrastructure/applications to carry out core operation and manage business IS/IT is distributed throughout the organisation, systems are NOT critical to the business and used solely to improve efficiency IS/IT is distributed throughout the organisation, systems ARE critical to the business IS/IT is centralised, systems are NOT critical to business operations IS/IT is centralised, systems ARE critical to business operations IS/IT function outsourced IS/IT function is perceived as making a value-added to the business IS/IT function is perceived as business enabler IS/IT function is perceived as business driver	Ward & Peppard (2002) Andersen (2001) Mintzberg et al.(1998) Allen & Boynton (1991)
IS staff or skills available regardless of whether employed or contracted Business analyst Systems analyst Programmer Information systems planner Information analyst Database administrator General IT consultant Network manager User support Technical support/systems programmer Project manager IS/IT trainer	Finlay & Marples (2000) Lederer & Salmela (1996)

Table 0.2 Rudimentary Planning: Control Hierarchy and Network

Sub criteria	Cluster	Sub clusters	Nodes
1 Policies	1P General Policy	11P Promoting Policy	115P Cost Saving
		13P Methodology Policy	132P No Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	211P No Measurement
	3P Learning Policy	31P Change Reviews Policy	311P No Reviews
		32P Learning Reviews Policy	322P No learning reviews

Sub criteria	Cluster	Sub clusters	Nodes
2. Knowledge Bank	1KB Available Skills	11KB Available Skills	111KB Technical Systems Programmer 112KB User Support
		12KB SISP Team Skills	122KB Adequate Technical Skills
	2KBApplied Knowledge	22KB Learning Reviews	221KB No Learning Reviews
		23KB Experience with Measurement	231KB No Formal Measurement
		24KB Satisfaction with Methodology	241KB Not aware of different SISP method
	4KBOrganization Profile	42KB Organization Profile	424KB No electronic trade
	5KB Planning Level	52KB Level of Planning	521KB Address only technical issues 524KB IT Projects embedded in business plan
3.Stakeholders Designation	1SCommitment	11S Commitment	113S Senior business management 114S Middle business management
		12S SISP Initiators	121S Senior Business Management
	2S Participation	21S Top Management Role	213S Not Involved 214S Sponsor
		22S Participation in SISP	223S Computer operations personnel 221S Vendors
	3S Reasons for SISP	31S Available Skills	311S Technical systems programmer 312S User support
		32S Reasons for SISP	324S Need to change production
4. Technology	1TApplications	11T Organization Profile	114T No electronic trade
		12T Applications	127T Traditional technology and applications 129T Legacy applications are still in place
	2TInfrastructure and Dependency on IT	21T Infrastructure	212T Infrastructure is stand alone
		22T Dependency on IT and IS	223T IS centralised and not critical to business
5. Form and Content	1F Content	11F Main Focus	113F Enhance efficiency of IT processes
		12F SISP Content	121F Addresses only technical issues 124F IT Projects embedded in business plan
		15F Focus of SISP objectives	157F Improve IS team

Sub criteria	Cluster	Sub clusters	Nodes
			performance 1511F Acquire new technology
	2F SISP Approach	22F SISP Approach	221F No specific SISP approach or method
		23F Methodology	232F No formal methodology
6 Collaboration	1C Alignment	11C Alignment	114C Bus. plan refers to specific IS applications
		12 C Link	121C No Link
	2CCommunication	22C Focus of SISP objectives	223C Improve IS team performance
7. Time Dimension	2TD Change Reviews	21TD Change reviews Frequency	211TD No reviews
8.Viability	1V Policy	12V SISP Link	121V No Link
		13V Change Reviews Policy	131V No Reviews
	3V Measurement	31V SISP Measurement Policy	311V No measurement
		33V Scope and scale of measurement	331V No formal documents for measurement
Merit of SISP	1B Benefit	11B Competitiveness	111B Lower costs 112B Product Differentiation 113B Creates barriers 114B Influence on buyers 115B Greater flexibility
		12B Productivity	121B Improved productivity 122B Improved quality in products and services 123B Efficient management of SISP resources
		13B Communication	131B Improved internal communication 132B Quality of decisions support enhanced
		14 B Alignment	141B Enabled existing business strategies 142B Helps with survival 143B Better understanding of IT potential
	1C Costs	11C Outlay	111C Cost of IT investments 112C IT management costs 113C IT human resources costs 114C Measurement Costs
	1O Opportunities	11O Possibilities	111O Knowledge Sharing in and between org. 112O Established electronic links 113O Greater ability to meet

Sub criteria	Cluster	Sub clusters	Nodes
			changes in the industry 114O Integration of IT in society 115O Change in organizational thinking
	1R Risks	11R Uncertainties	111R Strategic Uncertainty 112R Organizational Risks 113R IS Infrastructure Risks 114R Definitional uncertainty 115R Technological Uncertainty

Table 0.3 Ineffectual Planning: Control Hierarchy and Network

Sub criteria	Cluster	Sub clusters	Nodes
1 Policies	1P General Policy	11P Promoting Policy	115P Cost Saving
		12P Formulation Studies Policy	123P Feedback Study
		13P Methodology Policy	132P No Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	211P No Measurement
	3P Learning Policy	31P Change Reviews Policy	311P No Reviews
		32P Learning Reviews Policy	322P No learning reviews
	4PEnvironmental Policy	41P Environment Policy	418P Competitive Environment
2. Knowledge Bank	1KB Available Skills	11KB Available Skills	118KB Project Manager 1110KB Technical Systems Programmer 1111KB User Support
		12KB SISP Team Skills	122KB Adequate Technical Skills
	2KBApplied Knowledge	21KB Formulation Studies	211KB Feedback Study
		22KB Learning Reviews	221KB No Learning Reviews
		24KB Satisfaction with Methodology	241KB Not aware of different SISP method 242KB SISP methodology contributed to failure
	3KB Source of Expertise	31KB Expertise	312KB Hardware and Software Vendors 314KB Internal Resources
	4KBOrganization Profile	41KB Main Focus	413KB Enhance efficiency of IT processes
	5KB Planning Level	51KB Link	513KB Weak Link
		52KB Level of Planning	521KB Address only technical issues 523KB IS Projects embedded in IS plan

Sub criteria	Cluster	Sub clusters	Nodes
			524KB IT Projects embedded in business plan 525KB Tree year formal SISP planning 526KB Five year formal SISP planning
3.Stakeholders Designation	1SCommitment	11S Commitment	113S Senior business management 114S Middle business
		12S SISP Initiators	121S Senior Business Management 124S IS Staff Planners
	2S Participation	21S Top Management Role	213S Not Involved 214S Sponsor 214S Supporting Role
		22S Participation in SISP	223S Computer operations personnel 226S Middle business management 2211S Vendors
	3S Reasons for SISP	31S Available Skills	319S Project manager 3111S Technical systems programmer 3112S User support
		32S Reasons for SISP	321S Competitive pressure 322S IT executive change 323S IT reorganization 324S Need to change production
4. Technology	1TApplications	11T Organization Profile	114T No electronic trade
		12T Applications	127T Traditional technology and applications
	2TInfrastructure and Dependency on IT	21T Infrastructure	212T Infrastructure is stand alone
		22T Dependency on IT and IS	223T IS centralised and not critical to business
5. Form and Content	1F Content	11F Main Focus	112F Increase competitiveness 113F Enhance efficiency of IT processes
		12F SISP Content	121F Addresses only technical issues 123F IS Projects embedded in IS plan 124F IT Projects embedded in business plan
		13F SISP Formulation	131F Feed back study
		14F External Environment	148F Companies competitive

Sub criteria	Cluster	Sub clusters	Nodes
			environment
		15F Focus of SISP objectives	157F Improve IS team performance 158F Leverage organization capabilities 159F Lower costs or product differentiation 1511F Acquire new technology
	2F SISP Approach	22F SISP Approach	221F No specific SISP approach or method
		23F Methodology	232F No formal methodology
6.Collaboration	1C Alignment	11C Alignment	114C Bus. plan refers to specific IS applications
		12 C Link	122C Weak Link
	2CCommunication	22C Focus of SISP objectives	223C Improve IS team performance
7. Time Dimension	1TDSISP Horizon	11TD Level of SISP	12TD Three year formal SISP plan 13TD Five year formal SISP plan
	2TD Change Reviews	21TD Change reviews Frequency	26TD Once in 3 years
8.Viability	1V Policy	12V SISP Link	121V No Link 122V Weak Link
		13V Change Reviews Policy	131V No Reviews
		14V Environment Policy	148V Competitive environment
	3V Measurement	31V SISP Measurement Policy	311V No measurement
		33V Scope and scale of measurement	331V No formal documents for measurement 332V Problem with non financial measurement
Merit of SISP	1B Benefit	11B Competitiveness	111B Lower costs 112B Product Differentiation 113B Creates barriers 114B Influence on buyers 115B Greater flexibility
		12B Productivity	121B Improved productivity 122B Improved quality in products and services 123B Efficient management of SISP resources
		13B Communication	131B Improved internal communication 132B Quality of decisions support enhanced
		14 B Alignment	141B Enabled existing business

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			strategies 142B Helps with survival 143B Better understanding of IT potential
	1C Costs	11C Outlay	111C Cost of IT investments 112C IT management costs 113C IT human resources costs 114C Measurement Costs
	1O Opportunities	11O Possibilities	111O Knowledge Sharing in and between org. 112O Established electronic links 113O Greater ability to meet changes in the industry 114O Integration of IT in society 115O Change in organizational thinking
	1R Risks	11R Uncertainties	111R Strategic Uncertainty 112R Organizational Risks 113R IS Infrastructure Risks 114R Definitional uncertainty 115R Technological Uncertainty

Table 0.4 Attainable Planning: Control Hierarchy and Network

Sub criteria	Cluster	Sub clusters	Nodes
1 Policies	1P General Policy	11P Promoting Policy	115P Cost Saving 112P Responsiveness to Environment
		12P Formulation Studies Policy	122P Feed forward Study 123P Feedback Study
		13P Methodology Policy	131P Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	212P Formal Measurement
		22P Measurement Objectives Policy	221P Improve Control of IT Projects 222P Improve Estimating for Future Plans 223P To Gain Top Management Support 224P To Identify Best Practices
	3P Learning Policy	31P Change Reviews Policy	311P No Reviews 314P Once per Year 315P Once in 2 Years 316P Once in 3 Years
		32P Learning Reviews Policy	322P No learning reviews
	4PEnvironmental Policy	41P Environment Policy	411P Political System and Gov. Polices 413P Social Issues 414P Legal Trends 416P Technological Barriers 417P Pressure Groups and stakeholders 418P Competitive Environment
2. Knowledge Bank	1KB Available Skills	11KB Available Skills	114KB General IT consultant 115KB Information Systems Planner 116KB Network Manager 117KB Programmer 118KB Project Manager 119 KB Systems Analyst 1110KB Technical Systems Programmer 1111KB User Support
		12KB SISP Team Skills	121KB Adequate Project Management Skills 122KB Adequate Technical Skills

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
	2KBApplied Knowledge	21KB Formulation Studies	211KB Feedback Study 212KB Feedforward Study
		22KB Learning Reviews	221KB No Learning Reviews
		24KB Satisfaction with Methodology	243KB Improving SISP methodology 242KB SISP methodology contributed to failure
	3KB Source of Expertise	31KB Expertise	311KB Books or Periodicals 313KB Consultants 314KB Internal Resources
	4KBOrganization Profile	41KB Main Focus	412KB Increase competitiveness 413KB Enhance efficiency of IT processes
		42KB Organization Profile	421KB High-Teck 422KB Innovation Driven
	5KB Planning Level	51KB Link	512KB Integrated 513KB Weak Link
		52KB Level of Planning	521KB Address only technical issues 522KB Address socio technical issues 525KB Tree year formal SISP planning 526KB Five year formal SISP planning
3.Stakeholders Designation	1SCommitment	11S Commitment	111S CEO 112S CIO 113S Senior business management 114S Middle business management 115S IS Management
		12S SISP Initiators	121S Senior Business Management 122S Information Systems Management 124S IS Staff Planners 125S Users and IS management together
	2S Participation	21S Top Management Role	211S Active Leadership 212S Champion 214S Sponsor 214S Supporting Role

Sub criteria	Cluster	Sub clusters	Nodes
		22S Participation in SISP	223S Computer operations personnel 224S Consultant 225S IS Management 226S Middle business mngmnt 229S Systems analysts and developers
	3S Reasons for SISP	31S Available Skills	313S General IT consultant 315S Information systems planner 317S Network manager 319S Project manager 3110S Systems analyst 3111S Technical systems programmer 3112S User support
		32S Reasons for SISP	321S Competitive pressure 322S IT executive change 323S IT reorganization 324S Need to change production
4. Technology	1TApplications	11T Organization Profile	111T High-Teck 112T Innovation Driven
		12T Applications	121T Web based applications 125T Voice recognition applications 128T Security applications 129T Legacy applications are still in place
	2TInfrastructure and Dependency on IT	21T Infrastructure	211T Infrastructure is integrated 212T Infrastructure is stand alone
		22T Dependency on IT and IS	221T IS distributed and not critical to business 223T IS centralised and not critical to business
5. Form and Content	1F Content	11F Main Focus	111F Enhance strategic decision making process 112F Increase competitiveness 113F Enhance efficiency of IT processes
		12F SISP Content	121F Addresses only technical issues 123F IS Projects embedded in IS plan
		13F SISP Formulation	131F Feed back study

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			132F Feed forward study
		14F External Environment	141F Political system & government polices 143F Social issues 144F Legal trends 146F Technological barriers 147F Pressure groups & stakeholders 148F Companies competitive environment
		15F Focus of SISP objectives	151F Competitive advantage 154F Enable existing business strategies 157F Improve IS team performance 158F Leverage organization capabilities 159F Lower costs or product differentiation 1511F Acquire new technology
	2F SISP Approach	21F Alignment	211F IS Plan aligned with Bus. Mission and Goals
		22F SISP Approach	223F Specific Approach is used
		23F Methodology	231F Formal Methodology
6.Collaboration	1C Alignment	11C Alignment	111C IS Plan aligned with Bus. Mission and Goals 112C IS Plan Supports Business Strategies 113C Businesses plan refers to IS plan
		12 C Link	122C Weak Link 123C Integrated 125C Vertical Links
		13C Measurement Objectives	131C Communicate best practices
	2CCommunication	21C Communication	212C IT perceived as business enabler
		22C Focus of SISP objectives	221C Coordination with other functions 223C Improve IS team performance
7. Time Dimension	1TDSISP Horizon	11TD Level of SISP	11TD One year formal SISP plan 12TD Three year formal SISP plan 13TD Five year formal SISP plan

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
	2TD Change Reviews	21TD Change reviews Frequency	21TD No reviews 24TD Once per year 25TD Once in 2 years 26TD Once in 3 years
	3TD SISP Measurement	31TD SISP Measurement Frequency	34TD In post implementation phase 35TD Only against original objectives 36TD Only for strategic projects
8.Viability	1V Policy	12V SISP Link	121V Weak Link 123V Integrated 125V Vertical Link
		13V Change Reviews Policy	131V No Reviews 134V Once per year 135V Once in 2 years 136V Once in 3 years
		14V Environment Policy	141V Political system and government polices 143V Social issues 144V Legal trends 146V Technological barriers 147V Pressure groups and stakeholders 148V Competitive environment
	3V Measurement	31V SISP Measurement Policy	312V Formal measurement
		32V Measurement Timing	324V In post implementation phase 325V Only against original objectives
		33V Scope and scale of measurement	332V Problem with non financial measurement 333V Problem in understanding meas. theory
		34V What is Measured	343V Cost per unit 344V Customer satisfaction 346V Individual Performance 347V Investment costs 348V IT department performance
		35V Measurement Objectives	351V Improve control of IS projects 352V Estimate for future plans 353V Top management support

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			354V Best practices
Merit of SISP	1B Benefit	11B Competitiveness	111B Lower costs 112B Product Differentiation 113B Creates barriers 114B Influence on buyers 115B Greater flexibility
		12B Productivity	121B Improved productivity 122B Improved quality in products and services 123B Efficient management of SISP resources
		13B Communication	131B Improved internal communication 132B Quality of decisions support enhanced
		14 B Alignment	141B Enabled existing business strategies 142B Helps with survival 143B Better understanding of IT potential
	1C Costs	11C Outlay	111C Cost of IT investments 112C IT management costs 113C IT human resources costs 114C Measurement Costs
	1O Opportunities	11O Possibilities	111O Knowledge Sharing in and between org. 112O Established electronic links 113O Greater ability to meet changes in the industry 114O Integration of IT in society 115O Change in organizational thinking
	1R Risks	11R Uncertainties	111R Strategic Uncertainty 112R Organizational Risks 113R IS Infrastructure Risks 114R Definitional uncertainty 115R Technological Uncertainty

Table 0.5 Sustainable Planning: Control Hierarchy and Network

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
1 Policies	1P General Policy	11P Promoting Policy	111P Ideas and Knowledge Sharing 112P Responsiveness to Environment 113P Cordial Relationships 114P Lowering Cultural Gaps 115P Cost Saving
		12P Formulation Studies Policy	121P Predictive Study 122P Feed forward Study 123P Feedback Study
		13P Methodology Policy	131P Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	212P Formal Measurement
		22P Measurement Objectives Policy	221P Improve Control of IT Projects 222P Improve Estimating for Future Plans 223P To Gain Top Management Support 224P To Identify Best Practices
	3P Learning Policy	31P Change Reviews Policy	312P Quarterly 313P Once per Six Months 314P Once per Year
		32P Learning Reviews Policy	321P Formal Learning Reviews
	4PEnvironmental Policy	41P Environment Policy	411P Political System and 412P World Economy 413P Social Issues 414P Legal Trends 415P Ecological Trends 416P Technological Barriers 417P Pressure Groups and stakeholders
2. Knowledge Bank	1KB Available Skills	11KB Available Skills	111KB Business Analyst 112KB Database Administrator 115KB Information Systems Planner 116KB Network Manager 117KB Programmer 118KB Project Manager 119 KB Systems Analyst 1110KB Technical Systems Programmer 1111KB User Support

Sub criteria	Cluster	Sub clusters	Nodes
		12KB SISP Team Skills	121KB Adequate Project Management Skills 122KB Adequate Technical Skills 123KB Entrepreneurial marketing style 124KB Knowledge about Business Objectives 125KB Strategically Thinking Capability
	2KBApplied Knowledge	21KB Formulation Studies	211KB Feedback Study 212KB Feedforward Study
		22KB Learning Reviews	222KB SISP Experience Shared
		23KB Experience with Measurement	234KB Measurement not Reliable 235KB Satisfactory Measurement
		24KB Satisfaction with Methodology	243KB Improving SISP methodology 244KB Chosen approach satisfactory
	3KB Source of Expertise	31KB Expertise	311KB Books or Periodicals 313KB Consultants 314KB Internal Resources 315KB University Consultants
	4KBOrganization Profile	41KB Main Focus	411KB Strategic decision making process 412KB Increase competitiveness 413KB Enhance efficiency of IT processes
		42KB Organization Profile	421KB High-Teck 422KB Innovation Driven 423KB Knowledge Intensive
	5KB Planning Level	51KB Link	511KB Partners 512KB Integrated
		52KB Level of Planning	522KB Address socio technical issues 523KB IS Projects embedded in IS plan 524KB IT Projects embedded 525KB Tree year formal SISP planning 526KB Five year formal SISP planning
3.Stakeholders Designation	1S	11S Commitment	111S CEO

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
	Commitment		112S CIO 113S Senior business management 114S Middle business management 115S IS Management
		12S SISP Initiators	121S Senior Business Management 122S Information Systems Management 123S Senior business and IS mng. together 124S IS Staff Planners 125S Users and IS management together 126S Users business and IS mng. coalition
	2S Participation	21S Top Management Role	211S Active Leadership 212S Champion 213S Not Involved 214S Sponsor 214S Supporting Role
		22S Participation in SISP	221S Chief Executive Officer 222S Chief Information Officer 224S Consultant 225S IS Management 226S Middle business mngmnt 227S Senior business mngmnt 228S Stakeholders 229S Systems analysts and developers 2210S Users
	3S Reasons for SISP	31S Available Skills	311S Business analyst 312S Database administrator 315S Information systems planner 317S Network manager 318S Programmer 319S Project manager 3110S Systems analyst 3111S Technical systems programmer 3112S User support

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
		32S Reasons for SISP	325S SISP planning is continues process
4. Technology	1TApplications	11T Organization Profile	111T High-Teck 112T Innovation Driven 113T Knowledge Intensive
		12T Applications	121T Web based applications 122T Decision support applications 124T Expert Systems 125T Voice recognition applications 126T Data warehousing 127T Traditional technology and applications 128T Security applications 1210T Data Mining
	2TInfrastructure and Dependency on IT	21T Infrastructure	211T Infrastructure is integrated
		22T Dependency on IT and IS	222T IS distributed and critical to business 224T IS centralised and critical to business
5.Form and Content	1F Content	11F Main Focus	111F Enhance strategic decision making process 112F Increase competitiveness 113F Enhance efficiency of IT processes
		12F SISP Content	122F Addresses socio technical issues 123F IS Projects embedded in IS plan
		13F SISP Formulation	131F Feed back study 132F Feed forward study
		14F External Environment	141F Political system & government polices 142F World economy 143F Social issues 144F Legal trends 145F Ecological trends 146F Technological barriers 147F Pressure groups & stakeholders 148F Companies competitive environment

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
		15F Focus of SISP objectives	151F Competitive advantage 152F Coordination 153F Create barriers 154F Enable existing business strategies 155F Establish electronic links 156F Improve customer satisfaction 157F Improve IS team performance 158F Leverage organization capabilities 159F Lower costs or product differentiation 1510F Provide database for decision making
	2F SISP Approach	21F Alignment 22F SISP Approach	211F IS Plan aligned with Bus. Mission and Goals 212F IS Plan Supports Business Strategies
			223F Specific Approach is used
		23F Methodology	231F Formal Methodology
6.Collaboration	1C Alignment	11C Alignment	111C IS Plan aligned with Bus. Mission and Goals 112C IS Plan Supports Business Strategies 113C Businesses plan refers to IS plan 115C Bus. and IS calendars are synchronized
		12 C Link	123C Integrated 124C Partners 125C Vertical Links 126C Horizontal Links
		13C Measurement Objectives	131C Communicate best practices
	2CCommunication	21C Communication	211C IT perceived as value adding to business 212C IT perceived as business enabler 213C IT perceived as business driver
		22C Focus of SISP objectives	221C Coordination with other functions 223C Improve IS team

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			performance
7.TimeDimension	1TD SISP Horizon	11TD Level of SISP	11TD One year formal SISP plan 12TD Three year formal SISP plan 13TD Five year formal SISP plan
	2TD Change Reviews	21TD Change reviews Frequency	22TD Quarterly 23TD Once per six months 27TD Continues change reviews
	3TD SISP Measurement	31TD SISP Measurement Frequency	31TD Against current reviewed objectives 32TD Before during and after IS project 33TD Before the IS project 34TD In post implementation 36TD Only for strategic projects 37TD Used for all projects
8. Viability	1V Policy	11V Promoting Policy	111V Responsiveness to environment
		12V SISP Link	123V Integrated 124V Partners 125V Vertical Links2 126V Horizontal Links
		13V Change Reviews Policy	132V Quarterly 133V Once per six months 134V Once per year
		14V Environment Policy	141V Political system and government polices 142V World economy 143V Social issues 144V Legal trends 145V Ecological trends 146V Technological barriers 147V Pressure groups and stakeholders 148V Competitive environment
	2V Content	21V Formulation Studies	211V Predictive study
	3V Measurement	31V SISP Measurement Policy	312V Formal measurement
		32V Measurement Timing	321V Against current reviewed objectives 322V Before during and after finish of IS project

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			323V Before IS project starts 324V In post implementation phase 326V Only for strategic projects 327V Used for all projects
		33V Scope and scale of measurement	334V Not reliable measurement results 335V Successful measurement theory and practice
		34V What is Measured	341V Business value delivered 343V Cost per unit 344V Customer satisfaction 345V Duration of SISP processes 346V Individual Performance 347V Investment costs 348V IT department performance 349V Value of lost or gained opportunity 3410V Quality of deliverables 3411V SISP formulation efficiency 3412V SISP implementation efficiency
		35V Measurement Objectives	351V Improve control of IS projects 352V Estimate for future plans 353V Top management support 354V Best practices
Merit of SISP	1B Benefit	11B Competitiveness	111B Lower costs 112B Product Differentiation 113B Creates barriers 114B Influence on buyers 115B Greater flexibility
		12B Productivity	121B Improved productivity 122B Improved quality in products and services 123B Efficient management of SISP resources
		13B Communication	131B Improved internal communication 132B Quality of decisions support enhanced
		14 B Alignment	141B Enabled existing business

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			strategies 142B Helps with survival 143B Better understanding of IT potential
	1C Costs	11C Outlay	111C Cost of IT investments 112C IT management costs 113C IT human resources costs 114C Measurement Costs
	1O Opportunities	11O Possibilities	111O Knowledge Sharing in and between org. 112O Established electronic links 113O Greater ability to meet changes in the industry 114O Integration of IT in society 115O Change in organizational thinking
	1R Risks	11R Uncertainties	111R Strategic Uncertainty 112R Organizational Risks 113R IS Infrastructure Risks 114R Definitional uncertainty 115R Technological Uncertainty

Table 0.6 Adaptable Planning: Control Hierarchy and Network

Sub criteria	Cluster	Sub clusters	Nodes
1 Policies	1P General Policy	11P Promoting Policy	111P Ideas and Knowledge Sharing 112P Responsiveness to Environment 113P Cordial Relationships 114P Lowering Cultural Gaps 115P Cost Saving 116P Balanced Control with Spontaneity
		12P Formulation Studies Policy	121P Predictive Study 122P Feed forward Study 123P Feedback Study 124P Scenario Planning
		13P Methodology Policy	131P Formal Methodology
	2P Control Policy	21P SISP Measurement Policy	212P Formal Measurement
		22P Measurement Objectives Policy	221P Improve Control of IT Projects 222P Improve Estimating for Future Plans 223P To Gain Top Management Support 224P To Identify Best Practices
	3P Learning Policy	31P Change Reviews Policy	312P Quarterly 313P Once per Six Months 317P Continues Change Reviews
		32P Learning Reviews Policy	321P Formal Learning Reviews
	4PEnvironmental Policy	41P Environment Policy	411P Political System and Gov. Polices 412P World Economy 413P Social Issues 414P Legal Trends 415P Ecological Trends 416P Technological Barriers 417P Pressure Groups and stakeholders 418P Competitive Environment

Sub criteria	Cluster	Sub clusters	Nodes
2.Knowledge Bank	1KB Available Skills	11KB Available Skills	111KB Business Analyst 112KB Database Administrator 113KB General IT Consultant 114KB Information Analyst 115KB Information Systems Planner 116KB IS Trainer 117KB Programmer 118KB Project Manager 119KB Systems Analyst 110KB Technical Systems Programmer 111KB User Support 112KB Network Manager
		12KB SISP Team Skills	121KB Adequate Project Management Skills 122KB Adequate Technical Skills 123KB Entrepreneurial marketing style 124KB Knowledge about Business Objectives 125KB Strategically Thinking Capability
	2KBApplied Knowledge	21KB Formulation Studies	211KB Feedback Study 212KB Feedforward Study 213KB Predictive Study 214KB Scenario Planning
		22KB Learning Reviews	222KB SISP Experience Shared
		23KB Experience with Measurement	235KB Satisfactory Measurement 236KB Automated tools used
		24KB Satisfaction with Methodology	243KB Improving SISP methodology 244KB Chosen approach satisfactory
	3KB Source of Expertise	31KB Expertise	311KB Books or Periodicals 312KB Hardware and Software Vendors 313KB Consultants 314KB Internal Resources 315KB University Consultants

Sub criteria	Cluster	Sub clusters	Nodes
	4KBOrganization Profile	41KB Main Focus	411KB Strategic decision making process 412KB Increase competitiveness 413KB Enhance efficiency of IT processes
		42KB Organization Profile	421KB High-Teck 422KB Innovation Driven 423KB Knowledge Intensive
	5KB Planning Level	51KB Link	511KB Partners 512KB Integrated
		52KB Level of Planning	521KB Address socio technical issues 522KB Tree year formal SISP planning 523KB Five year formal SISP planning
3.Stakeholders Designation	1S Commitment	11S Commitment	111S CEO 112S CIO 113S Senior bus. management 114S Middle business management 115S IS Management
		12S SISP Initiators	121S Senior Business Management 122S Information Systems Management 123S Senior business and IS mng. together 124S IS Staff Planners 125S Users and IS management together 126S Users business and IS mng. coalition
	2S Participation	21S Top Management Role	211S Active Leadership 212S Champion 213S Not Involved 214S Sponsor 214S Supporting Role
		22S Participation in SISP	221S Chief Executive Officer 222S Chief Information Officer 223S Computer operations personnel

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			224S Consultant 225S IS Management 226S Middle business mngmnt 227S Senior business mngmnt 228S Stakeholders 229S Systems analysts and developers 2210S Users
	3S Reasons for SISP	31S Available Skills	311S Business analyst 312S Database administrator 313S General IT consultant 314S Information analyst 315S Information systems planner 316S IS Trainer 317S Network manager 318S Programmer 319S Project manager 3110S Systems analyst 3111S Technical systems programmer 3112S User support
		32S Reasons for SISP	325S SISP planning is continues process
4. Technology	1TApplications	11T Organization Profile	111T High-Teck 112T Innovation Driven 113T Knowledge Intensive
		12T Applications	121T Web based applications 122T Decision support applications 123T Nan technology or neural networking 124T Expert Systems 125T Voice recognition applications 126T Data warehousing 127T Traditional technology and applications 128T Security applications 1210T Data Mining
	2TInfrastructure and	21T Infrastructure	211T Infrastructure is integrated

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
	Dependency on IT	22T Dependency on IT and IS	222T IS distributed and critical to business 224T IS centralised and critical to business
5.Form and Content	1F Content	11F Main Focus	111F Enhance strategic decision making process 112F Increase competitiveness 113F Enhance efficiency of IT processes
		12F SISP Content	122F Addresses socio technical issues
		13F SISP Formulation	131F Feed back study 132F Feed forward study
		14F External Environment	141F Political system & government polices 142F World economy 143F Social issues 144F Legal trends 145F Ecological trends 146F Technological barriers 147F Pressure groups & stakeholders 148F Companies competitive environment
		15F Focus of SISP objectives	151F Competitive advantage 152F Coordination 153F Create barriers 154F Enable existing business strategies 155F Establish electronic links 156F Improve customer satisfaction 157F Improve IS team performance 158F Leverage organization capabilities 159F Lower costs or product differentiation 1510F Provide database for decision making 1511F Acquire new technology
	2F SISP Approach	21F Alignment	211F IS Plan aligned with Bus. Mission and Goals 212F IS Plan Supports Business

Sub criteria	**Cluster**	**Sub clusters**	**Nodes**
			Strategies
		22F SISP Approach	223F Specific Approach is used
		23F Methodology	231F Formal Methodology
6. Collaboration	1C Alignment	11C Alignment	111C IS Plan aligned with Bus. Mission and Goals 112C IS Plan Supports Business Strategies 113C Businesses plan refers to IS plan 115C Bus. and IS calendars are synchronized
		12 C Link	123C Integrated 124C Partners 125C Vertical Links 126C Horizontal Links
		13C Measurement Objectives	131C Communicate best practices
	2C Communication	21C Communication	211C IT perceived as value adding to business 212C IT perceived as business enabler 213C IT perceived as business driver
		22C Focus of SISP objectives	221C Coordination with other functions 222C Establish electronic links 223C Improve IS team performance
7. Time Dimension	1TD SISP Horizon	11TD Level of SISP	11TD One year formal SISP plan 12TD Three year formal SISP plan 13TD Five year formal SISP plan
	2TD Change Reviews	21TD Change reviews Frequency	22TD Quarterly 23TD Once per six months 27TD Continues change reviews
	3TD SISP Measurement	31TD SISP Measurement Frequency	31TD Against current reviewed objectives 32TD Before during and after IS project 33TD Before the IS project 37TD Used for all projects starts
8. Viability	1V Policy	11V Promoting Policy	111V Responsiveness to environment
		12V SISP Link	123V Integrated

Sub criteria	Cluster	Sub clusters	Nodes
			124V Partners 125V Vertical Links
		13V Change Reviews Policy	132V Quarterly 133V Once per six months 137V Continues change reviews
		14V Environment Policy	141V Political system and government polices 142V World economy 143V Social issues 144V Legal trends 145V Ecological trends 146V Technological barriers 147V Pressure groups and stakeholders 148V Competitive environment
	2V Content	21V Formulation Studies	211V Predictive study 212V Scenario Planning
	3V Measurement	31V SISP Measurement Policy	312V Formal measurement
		32V Measurement Timing	321V Against current reviewed objectives 322V Before during and after finish of IS project 323V Before IS project starts 327V Used for all projects
		33V Scope and scale of measurement	335V Successful measurement theory and practice 336V Automation tools for metrics
		34V What is Measured	341V Business value delivered 342V Cost of measurement 343V Cost per unit 344V Customer satisfaction 345V Duration of SISP processes 346V Individual Performance 347V Investment costs 348V IT department performance 349V Value of lost or gained opportunity 3410V Quality of deliverables 3411V SISP formulation efficiency 3412V SISP implementation

Sub criteria	Cluster	Sub clusters	Nodes
			efficiency
		35V Measurement Objectives	351V Improve control of IS projects 352V Estimate for future plans 353V Top management support 354V Best practices
Merit of SISP	1B Benefit	11B Competitiveness	111B Lower costs 112B Product Differentiation 113B Creates barriers 114B Influence on buyers 115B Greater flexibility
		12B Productivity	121B Improved productivity 122B Improved quality in products and services 123B Efficient management of SISP resources
		13B Communication	131B Improved internal communication 132B Quality of decisions support enhanced
		14 B Alignment	141B Enabled existing business strategies 142B Helps with survival 143B Better understanding of IT potential
	1C Costs	11C Outlay	111C Cost of IT investments 112C IT management costs 113C IT human resources costs 114C Measurement Costs
	1O Opportunities	11O Possibilities	111O Knowledge Sharing in and between org. 112O Established electronic links 113O Greater ability to meet changes in the industry 114O Integration of IT in society 115O Change in organizational thinking
	1R Risks	11R Uncertainties	111R Strategic Uncertainty 112R Organizational Risks 113R IS Infrastructure Risks 114R Definitional uncertainty 115R Technological Uncertainty

Appendix C

Questionnaire

ABOUT YOURSELF

1. What is your position in the organization?

- □ CEO
- □ CIO
- □ Information Systems Manager
- □ Divisional Manager
- □ Accounting Manager
- □ Financial Controller
- □ Other ___________________________________

2. Please indicate your years of experience in the industry.

- □ 0-5 years
- □ 6-10 years
- □ 11-15 years
- □ 16-20 years
- □ More than 20 years

3. Please indicate your years of experience with this company.

- □ 0-5 years
- □ 6-10 years
- □ 11-15 years
- □ 16-20 years
- □ More than 20 years

4. Please indicate your years of experience in information system area

- □ 0-5 years
- □ 6-10 years
- □ 11-15 years
- □ 16-20 years
- □ More than 20 years

5. Please indicate your years of experience in SISP

- □ 0-5 years
- □ 6-10 years
- □ 11-15 years
- □ 16-20 years
- □ More than 20 years

6. Please indicate your current level of contribution to SISP in this company

- □ No contribution
- □ Minor contribution
- □ Fair contribution
- □ Major contribution

7. Do you hold formal tertiary qualification?

- ◻ YES
- ◻ NO

ABOUT YOU ORGANIZATION

8. Please indicate the industry type your organization belongs to?

- ◻ Consulting and technical services
- ◻ Mining or quarrying
- ◻ Electricity and gas supply
- ◻ Communication
- ◻ Defence
- ◻ Public administration (Federal, State, Local)
- ◻ Transport and storage
- ◻ Education
- ◻ Research and development
- ◻ Wholesale trade
- ◻ Retail trade
- ◻ Construction
- ◻ Agriculture, forestry or fishing
- ◻ Insurance
- ◻ Banking/Finance
- ◻ Recreation, personal and other services
- ◻ Health
- ◻ Retail
- ◻ Computer services
- ◻ Other____

9. In which state or territory is your organization based?

- ◻ NSW
- ◻ WA
- ◻ VIC
- ◻ TAS
- ◻ QLD
- ◻ ACT
- ◻ SA
- ◻ NT

10. What is the approximate turnover of your company?

- ◻ Less than 1million
- ◻ $1-10m
- ◻ $11m to 20m
- ◻ $21m to 50m
- ◻ $51m to 100m
- ◻ $1001m to $500m
- ◻ $500M to 1billion
- ◻ More than 1billion
- ◻ Don't know

11. Which of these categories best describe your organization in terms of number of employees?

- ◻ Less than 20
- ◻ 21 to 99 employees
- ◻ 100 to 499 employees
- ◻ 500 to 999 employees
- ◻ 1000 to 4999 employees

- □ 5000 to 10000 employees
- □ 10000 or more employees

12. Which of these categories best describe your organization in terms of number of IS employees?

- □ Less than 10 employees
- □ 10 to 20 employees
- □ 20 to 49 employees
- □ 50 to 99 employees
- □ 100 to 199 employees
- □ 200 and above employees

13. Please indicate percentage breakdown spending for IT investments.

- □ No formal budget allocation
- □ Less than 1% of total turnover
- □ Between 1% and 2% of total turnover
- □ More than 2% of turnover
- □ Less than 1% of total investment budget
- □ 1% to 5 % of total investment budget
- □ 5% to 10% of total investment budget
- □ 10% to 50% of total investment budget
- □ More than 50% of total investment budget
- □ Other________________________________

14. Would you consider your organization

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ High-Teck
- □ Innovation-driven
- □ Knowledge-intensive
- □ High performance e-business
- □ Electronic solutions integrator
- □ Product consultant (specialised in the customisation of the products of a particular development firm)
- □ No intention to trade electronically

15. What IT/IS infrastructure/applications are in place or planned to be used? (Select all applicable)

- □ Nanotechnology
- □ Neural networking
- □ Internet
- □ Intranet
- □ Extranet
- □ Wireless technology (Second generation)
- □ Wireless technology (Third generation)
- □ Local area networks (LAN)
- □ Wide area networks (WAN)
- □ Client/server network
- □ Peer-to-peer network
- □ Decision support systems
- □ Distributed databases
- □ Relational Database
- □ Data warehousing
- □ Data Mining
- □ Electronic Data Interchange (EDI)
- □ Executive Information Systems (EIS)

- □ Expert Systems (ES)
- □ Virtual reality systems
- □ Voice recognition systems
- □ Web based technology
- □ CASE technology
- □ 4GL (4th Generation language for end-user development)
- □ Multimedia - using high bandwidth networks
- □ Traditional separate data, text, imaging/graphics, voice and video
- □ Security & risk management infrastructure (firewalls, etc.)
- □ Application infrastructure is integrated
- □ Legacy applications are replaced by an integrated package
- □ Application infrastructure is stand-alone
- □ Object oriented development environment
- □ Bar-code readers
- □ Other________________________________

16. What is the degree of dependency on IT/IS infrastructure/applications to carry out core operation and manage business?
(Select all applicable)

- □ IS/IT is distributed throughout the organisation, systems are NOT critical to the business and used solely to improve efficiency
- □ IS/IT is distributed throughout the organisation, systems ARE critical to the business
- □ IS/IT is centralised, systems are NOT critical to business operations
- □ IS/IT is centralised, systems ARE critical to business operations
- □ IS/IT function outsourced
- □ IS/IT function is perceived as making a value-added to the business
- □ IS/IT function is perceived d as business enabler
- □ IS/IT function is perceived d as business driver

17. Please indicate which of the following IS staff or skills are presently available to your organization, regardless of whether employed or contracted.
(1) Available (2) Not available

- □ Business analyst
- □ Systems analyst
- □ Programmer
- □ Information systems planner
- □ Information analyst
- □ Database administrator
- □ General IT consultant
- □ Network manager
- □ User support
- □ Technical support/systems programmer
- □ Project manager
- □ IS/IT trainer
- □ Other____________________________

18. Does your organization undertake Strategic Information Systems Planning (SISP)?

- □ No formal Strategic Information Systems Planning
- □ Some Information Systems Planning
- □ Some Strategic Information Systems Planning
- □ Currently developing Strategic Information Systems Planning
- □ Regular Strategic Information Systems Planning

NOTE:

If your organization had or is currently developing SISP, please continue to answer the remaining questions.
If your organization has not been involved in the SISP process, there is no need to continue the questionnaire. Thank you for your assistance and taking the time to be involved in this survey. The information provided so far is valuable to us. When completed please return this survey using the enclosed postage paid envelope.
If you are interested in survey results, please provide contact details at the end of this survey.

SISP ASSESSMENT

19 Please indicate the level of SISP planning in your organization.

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ More tactical than IS strategic planning
- □ IS plan address only technical issues
- □ IS plan address socio-technical issues
- □ IS Projects embedded in IS plan
- □ IT Projects embedded in business plan
- □ One-year formal SISP plans
- □ Three- year SISP plans
- □ Five year SISP planning
- □ Other ________________________________

20. Participants who play the major roles in SISP have relevant skills. Please indicate your level of agreement with each statement.

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ The SISP team has adequate technical skills
- □ The SISP team has adequate project management skills
- □ The SISP team has adequate business skills
- □ The SISP team adopts an entrepreneurial marketing style
- □ The SISP team has strategically thinking capability
- □ The SISP team has knowledge about organisational objectives and goals

21. To what degree, if any, have the SISP approaches listed bellow been used in your organization:

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ No specific SISP approach has been used
- □ Organisational
- □ Business led
- □ Administrative
- □ Method driven
- □ Technological
- □ Other _____________________________

22. To what degree, if any, have the following methodologies and techniques been used in conjunction with the chosen approach?

(1) Not used (2) To some degree used (3) Used

- □ No specific method/technique has been used
- □ Bottom-up
- □ Top-down
- □ Combination of above
- □ Inside-out
- □ SWOT analysis
- □ Information Systems Planning

- ◻ Balanced Scored analysis
- ◻ Value Chain Analysis
- ◻ Method/1
- ◻ Summit S & Summit D
- ◻ 4Front
- ◻ Information Engineering Work Bench IEW
- ◻ Information Engineering
- ◻ Business Systems Planning
- ◻ Business portfolio analysis
- ◻ Information Quality Analysis
- ◻ Business Information Analysis & IntegrationTechnique
- ◻ Business Information Characterization Study
- ◻ Ends/Means Analysis
- ◻ Staged Approach
- ◻ Executive Information Planning
- ◻ Information Systems Investment Strategy
- ◻ Resource Life Cycle
- ◻ Current portfolio evaluation
- ◻ Technology assessment and IS/IT infrastructure review
- ◻ Fuzzy Cognitive Maps
- ◻ Other methodology/techniques:

23. Please indicate your satisfaction with chosen methodologies/techniques.
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- ◻ Chosen SISP approach (and methodologies /techniques) is considered satisfactory
- ◻ We are developing new methodology/technique to tailor for our specific needs
- ◻ We are considering changing our SISP approach to improve SISP
- ◻ We have not been aware of the existence of different SISP methodologies
- ◻ Chosen SISP methodology (or lack of it) contributed to failure of SISP

24. Please indicate the extent of participation in SISP for all involved in SISP process.
(1) Not involved (2) Supporting role (3) Active leadership (4) Sponsor (5) Champion

- ◻ CEO
- ◻ CIO
- ◻ IS management
- ◻ Senior business management
- ◻ Middle business management
- ◻ Users
- ◻ Systems analysts (developers)
- ◻ Computer systems programmer
- ◻ Computer operations personnel
- ◻ Vendors
- ◻ Consultant
- ◻ Stakeholders
- ◻ Other________________________

25. Person(s) who initiated strategic IS planning
(select all applicable):

- ◻ CEO
- ◻ CIO
- ◻ Senior business management
- ◻ IS management
- ◻ Middle management
- ◻ Senior business and IS management together
- ◻ IS and middle management together

- □ Senior business, IS, and middle management coalition
- □ IS staff planners
- □ Users and IS management together
- □ Users, business management and IS management coalition
- □ Other ____

26. What degree of commitment toward the SISP formulation is shown from the:

(1) No commitment (2) Committed only at start (3) Committed at implementation phase (4) Committed from start to finish

- □ CEO
- □ CIO
- □ Senior business management;
- □ Middle business management
- □ Only IS management
- □ Other __________________

27. Please indicate the sources for the expertise for SISP?

(1) Not used (2) To some degree used (3) Main source

- □ Internal resources
- □ Software vendors
- □ Computer hardware vendors
- □ Books or periodicals
- □ Consultants
- □ Government and semi-government bodies
- □ University consultants

28. During the SISP formulation process does your organization undertake?

(select all applicable):

- □ Predictive study (what may affect IS/IT function in the future and how IS/IT function can respond to different proposed systems)
- □ Feed forward study (analysis of all important existing components such as hardware, software, resources, etc. which could be useful for a proposed new system)
- □ Feed back study (analysis of existing components such as hardware, software, resources, etc which must change/replace)
- □ We perform tool-based, qualitative and quantitative scenario analysis to understand the consequences of a wide range of possible changes.

29. Did periodical change reviews of SISP implementation take place?

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ No reviews
- □ Tracking data is used for re-planning on a regular basis(at least quarterly)
- □ Once per six months
- □ Once per year
- □ Once in 2 years
- □ Once in 3 years
- □ Irregularly
- □ Change reviews are continues process

30. Please indicate your experience with learning reviews.

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ No learning reviews
- □ We capture and share project's intellectual capital with all participants
- □ Learning on IS/IT impact on customers' behaviour is shared
- □ Learning on technology applications are shared
- □ Learning on SISP experience are shared

31. To what degree has the need for IS planning/review been influenced by:

(1) No influence (2) Some influence (3) Important influence (4) Critical influence

- □ IT executive change
- □ IT reorganization
- □ IT consolidation
- □ IT repositioning in the firm
- □ IT repositioning in the industry or society
- □ Senior business management
- □ Need to change production or production economics
- □ Competitive pressure
- □ SISP planning/review is continues process

32. Please examine the list bellow and add others as required. Than with respect to company's core products or services and major customers and suppliers, please determine the importance of those SISP OBJECTIVES.

(1) Not objective (2) Not important objective (3) Some important objective (4) Important objective (5) Critical objective

- □ The need to acquire the new technology
- □ Provide advantage such as lower costs or product differentiation
- □ Influence the buyer's decision to switch to our products
- □ Leverage unique organisation capabilities
- □ Enable existing business strategies
- □ Create new business strategies
- □ Make it more for our customers to change suppliers
- □ Establish electronic links with suppliers or customers
- □ Competitive advantage through superior capabilities
- □ Provide common database for decision making and planning
- □ Improve customer satisfaction
- □ Improve IS team performance
- □ The strategic use of information to gain competitive advantage
- □ Create barriers to keep competitors from entering our markets
- □ Coordination of IS functions with marketing, finance and human resource function
- □ Other ____

33. Please evaluate the following statements related to the policy your SISP plan is promoting:

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ Innovative approach in solving customer problems
- □ Promoting new ideas and knowledge sharing
- □ Quick adaptation to external environmental changes
- □ Promoting cordial relationships between different departments to achieve business goals
- □ Lowering cultural gaps and other resistance and frictions
- □ Cost saving and reuse where appropriate
- □ Clear communications on all policies and responsibilities
- □ Balanced control with spontaneity
- □ Other ____

34. The main focus of our SISP planning is:

(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ Increase competitiveness
- □ Enhance strategic decision-making process
- □ Enhance efficiency of IT processes
- □ Other _____________________________________

35. Please examine the list bellow and add others as required. Then please evaluate those SISP CONCERNS that are thought to be the most important at this time.
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ Keeping up with technology
- □ Excessive spending on IS/IT (infrastructure, resources)
- □ Dealing with senior management
- □ Aligning IT strategy with business strategy
- □ Coping with internal environmental change
- □ Coping with external environmental change
- □ Gaining top management commitment
- □ Recruiting and retaining staff
- □ Maintaining service continuity
- □ Meeting business and user needs
- □ Infrastructure management
- □ Feasibility of strategy implementation
- □ Security issues
- □ Measuring IT's values
- □ Outsourcing of IS/IT
- □ Other ___________________________________

36. Please indicate the extent of alignment of information system planning and business planning in your organization.
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ The IS plan reflects the business plan mission
- □ The IS plan reflects the business plan goals
- □ The IS Plan supports the business strategies
- □ The IS Plan selects a portfolio that maximises total business value
- □ The IS plan recognizes external business environment forces
- □ The IS plan reflects the business plan resource constraints
- □ The business plan refers to the IS plan
- □ The business plan refers to specific IS applications
- □ The business plan refers to specific information technologies
- □ The business plan refers to value creation potential of information
- □ The business plan utilizes the strategic capability of IS
- □ The business plan contains reasonable expectations of IS
- □ Business and IS planning calendars are synchronised

37. In simple terms how would you define the LINK between IS/IT planning and business planning?
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ Partners
- □ Integrated
- □ Weak link
- □ No link

38. If applicable, please determine the importance of reasons for the SISP formulation failure.
(1) No importance (2) Some importance (3) Important (4) Very important (5) Crucial

- □ Lack of alignment with business objectives
- □ Inadequate framework used for setting IT investment priorities
- □ Inadequate methodology used
- □ No motivation for the initialisation of SISP reviews
- □ Unrealistic competitive advantage, mistaken impressions
- □ Budget limitations
- □ Inappropriate planning horizons

- □ The planning exercise is too expensive
- □ The planning exercise takes very long
- □ No review process
- □ No adequate knowledge and expertise
- □ No learning from past experience
- □ Intangible benefits are not presented to the sponsor
- □ Failure to consider the external business environment
- □ IS management is not part of the corporate planning process
- □ Lack of commitment from senior management
- □ Lack of senior management involvement
- □ Requires too much top management involvement
- □ Inappropriate measures or too much measurement
- □ Technology lagging behind needs
- □ Not fully investigated risk
- □ Other ________________________________

39. If applicable, please determine the importance of reasons for the SISP implementation failure.

(1) No importance (2) Some importance (3) Important (4) Very important (5) Crucial

- □ Lack of alignment with business objectives
- □ Inadequate framework used for setting IT investment priorities
- □ Inadequate methodology used
- □ No motivation for the initialisation of SISP
- □ Unrealistic competitive advantage, mistaken impressions
- □ Budget limitations
- □ Inappropriate planning horizons
- □ The planning exercise is too expensive
- □ The planning exercise takes very long
- □ No review process
- □ No adequate knowledge and expertise
- □ No learning from past experience
- □ Intangible benefits are not presented to the sponsor
- □ Failure to consider the external business environment
- □ IS management is not part of the corporate planning process
- □ Lack of commitment from senior management
- □ Lack of senior management involvement
- □ Requires too much top management involvement
- □ Inappropriate measures or too much measurement
- □ Technology lagging behind needs
- □ Rapid change of technology
- □ Cultural gap
- □ Not fully investigated risk
- □ Other ______________________________________

40. Please examine the list bellow and add others as required. Than please determine the importance of external environment factors most impacting SISP.

(1) No importance (2) Some importance (3) Important (4) Very important (5) Crucial

- □ A political system and government polices
- □ The world economy with an emphasis on monetarism and free market economics
- □ Social issues such as aging population, slow growth in population, growth of dual income
  households, growth of non-traditional households (i.e. singles, single parents, childless)
- □ Legal trends such as restrictions on e-business computer based fraud issues, patent policy etc.
- □ Limitations and new business opportunities imposed by ecological trends

- ◻ Technological barriers - coping with the pace of technological change
- ◻ Pressure groups & stakeholders such as clients, customers, employees, unions, public, financial institution, competitors, suppliers, etc.
- ◻ Company's immediate competitive environment (suppliers and customers)
- ◻ Others ____

41. Please indicate benefits of the SISP in your organization:
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- ◻ Enhanced competitiveness such as lower costs or product differentiation
- ◻ Creates barriers to keep competitors from entering our markets
- ◻ Improved productivity
- ◻ Improved internal communication
- ◻ Greater ability to meet changes in the industry
- ◻ Efficient and effective management of SISP resources
- ◻ Influenced the buyer's decision to switch to our products
- ◻ Enabled existing business strategies
- ◻ Established electronic links with suppliers or customers
- ◻ Helps with survival
- ◻ Improved quality in products/services
- ◻ Greater flexibility to meet changes external/internal environments
- ◻ Provided better understanding of IT/IS potential
- ◻ Quality of decisions support enhanced
- Other

42. Please estimate to what extent are SISP objectives accomplished and how sustainable are they in your organization.
(1) Very poor (2) Moderately poor (3) Neutral (4) Satisfactory (5) Very good

- ◻ Overall satisfaction with accomplishment of SISP objectives
- ◻ Satisfaction with SISP outputs
- ◻ Performance of SISP over the past one years
- ◻ Performance of SISP over the past two years
- ◻ Performance of SISP over the past five years

SISP MEASUREMENT

43. How do you perform measurement of the extent to which SISP formulation and implementation objectives have been achieved?
(Select all applicable)

- ◻ No formal SISP success measurement
- ◻ In-hose developed technique is used
- ◻ For every IS project a specific methodology/technique is developed/adapted
- ◻ Interviewing the 'champions'
- ◻ Using ad hoc procedure
- ◻ Return on investment (ROI)
- ◻ Balanced scorecard
- ◻ Value added
- ◻ Goal –Question-Metrics
- ◻ Case base reasoning
- ◻ Genetic programming
- ◻ Multi-objective, multi-criteria decision-making
- ◻ Boundary values;
- ◻ Return-on-management;
- ◻ Business process enhancement;
- ◻ Information economics;
- ◻ Experimental methods:
- ◻ Critical appraisal

- □ Other ________________________

44. When do you measure success/failure of SISP objectives?
(Select all applicable)

- □ We do not measure success/failure of the SISP objectives
- □ Before the IS project starts (to have a comparison ground)
- □ When the IS project finishes
- □ In post implementation phase
- □ Before, during implementation and after finish of the IS project
- □ Only for strategic projects
- □ Used for all projects
- □ Only against original objectives
- □ Against the current (reviewed) objectives

45. We have clearly defined purpose, scope, attributes, and scale of what we are trying to measure.
(1) Strongly Disagree (2) Disagree (3) Neither Agree or Disagree (4) Agree (5) Strongly Agree

- □ No formal documents which outline purpose (like software quality), scope (selection of applications) and attributes (like functionality, reliability, code reusability)
  We do not have clearly defined work plan details (as who is responsible for gathering data, when the metrics will be collected and how the metrics will be reported)
- □ We have a problem with not financial measurement such as defining attribute's natural scale (like scale for user satisfaction, the service/product level expected) and confirming accuracy of the measuring instrument (to know measurement error or variability)
- □ We have a problem in understanding measurement theory and analysis of gathered data.
- □ We have developed measurement model but result we getting seem to be not reliable (such as measurement side effects when people make the numbers look better)
- □ We have clear understanding of what to measure, how to measure, how often to measure, who is responsible for the measurement, and how to interpret the measurement data and we are doing it satisfactorily.
- □ We employ automation tools for metrics collection, aggregation and analysis

46. What do you measure during preparation or implementation of SISP?
(Select all applicable)

- □ How efficient is SISP formulation process in comparison with the best-known (time and
  resources).
- □ How effective are we at doing SISP implementation
- □ What are the costs (as investment costs for the IT department)
- □ What are the costs (as cost per unit such as the cost of internet access per user, etc.)
- □ What is value of the lost/gained opportunity?
- □ Quality of deliverables
- □ The IT department performance
- □ Individual performance
- □ Duration of SISP processes
- □ Effort and cost of collecting measurement data
- □ Customer satisfaction with the deliverables
- □ Business value delivered (return on the investment in IT projects)
- □ Other____

47. What are your measurement objectives?
(Select all applicable)

- □ Improve estimating for the future plans
- □ To gain top management support for the future projects
- □ To identify and communicate the best practices
- □ Improve control of IT/IS projects in terms of cost and time
- □ Increase man overing power
- □ Other ______________________________

48. Please estimate to what extent are measurement objectives accomplished and how sustainable are they in your organization?
(1) Very poor (2) Moderately poor (3) Neutral (4) Satisfactory (5) Very good (6) Excellent

- □ Overall satisfaction with accomplishment of measurement objectives
- □ Satisfaction with measurement outputs
- □ Benefit of SISP measurement over the past one year
- □ Benefit of SISP measurement over the past two years
- □ Benefit of SISP measurement over the past five years

Appendix D

Pilot Study Results

This is a report for how alternatives fed up through the system to give us our synthesized values.

Report for toplevel model with ratings

This is a report for how alternatives fed up through the system to give us our synthesized values.

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7213	1.0000	1
	TEST2	0.3863	0.2787	0.3863	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1Policies	1.0000	1	1Policies	0.3802	2
2Knowledge Bank	1.0000	1	2Knowledge Bank	0.4211	2
3Stakeholders Designation	1.0000	1	3Stakeholders Designation	0.3683	2
4Technology	1.0000	1	4Technology	0.1825	2
5Form and Content	1.0000	1	5Form and Content	0.5534	2
6Collaboration	1.0000	1	6Collaboration	0.2789	2
7Time Dimension	1.0000	1	7Time Dimension	0.3737	2
8Viability	1.0000	1	8Viability	0.5488	2
Benefit	1.0000	1	Benefit	0.4322	2
Costs	1.0000	1	Costs	0.2045	2
Opportunities	1.0000	1	Opportunities	0.4966	2
Risks	1.0000	1	Risks	0.2337	2

Report for 1Policies

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7245	1.0000	1
	TEST2	0.3802	0.2755	0.3802	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1P General Policy	0.6475	1	1P General Policy	0.3525	2
2P Measurement Policy	0.7291	1	2P Measurement Policy	0.2709	2
3P Change Review and Learning Policy	0.8000	1	3P Change Review and Learning Policy	0.2000	2
4P Environmental Policies	0.8399	1	4P Environmental Policies	0.1601	2

Report for 1Policies->1P General Policy

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.6475	0.6475	1.0000	1
	TEST2	0.3525	0.3525	0.5445	2

Ratings Information

This network is a bottom level network with ratings. So the alternatives for this network are found in the ratings system. The totals we get for the alternative priorities for this network come from the ratings system.

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6475	1
	TEST2	0.5445	0.5445	0.3525	2

Report for 1Policies->2P Measurement Policy

Graphic	Alternatives	Total	Normal	Ideal	Ranking

	TEST1	0.7291	0.7291	1.0000	1
	TEST2	0.2709	0.2709	0.3715	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7291	1
	TEST2	0.3715	0.3715	0.2709	2

Report for 1Policies->3P Change Review and Learning Policy

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8000	0.8000	1.0000	1
	TEST2	0.2000	0.2000	0.2500	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8000	1
	TEST2	0.2500	0.2500	0.2000	2

Report for 1Policies->4P Environmental Policies

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8399	0.8399	1.0000	1
	TEST2	0.1601	0.1601	0.1906	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8399	1
	TEST2	0.1906	0.1906	0.1601	2

Report for 2Knowledge Bank

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7037	1.0000	1
	TEST2	0.4211	0.2963	0.4211	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1KB Available Skills	0.6717	1	1KB Available Skills	0.3283	2
2KB Applied Knowledge	0.7743	1	2KB Applied Knowledge	0.2257	2
3KB Expertise	0.7204	1	3KB Expertise	0.2796	2
4KB Profile	0.5672	1	4KB Profile	0.4328	2
5KB Planning Level	0.7673	1	5KB Planning Level	0.2327	2

Report for 2Knowledge Bank->1KB Available Skills

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.6717	0.6717	1.0000	1
	TEST2	0.3283	0.3283	0.4888	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6717	1
	TEST2	0.4888	0.4888	0.3283	2

Report for 2Knowledge Bank->2KB Applied Knowledge

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7743	0.7743	1.0000	1
	TEST2	0.2257	0.2257	0.2915	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7743	1

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST2	0.2915	0.2915	0.2257	2

Report for 2Knowledge Bank->3KB Expertise

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7204	0.7204	1.0000	1
	TEST2	0.2796	0.2796	0.3881	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7204	1
	TEST2	0.3881	0.3881	0.2796	2

Report for 2Knowledge Bank->4KB Profile

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.5672	0.5672	1.0000	1
	TEST2	0.4328	0.4328	0.7632	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.5672	1
	TEST2	0.7632	0.7632	0.4328	2

Report for 2Knowledge Bank->5KB Planning Level

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7673	0.7673	1.0000	1
	TEST2	0.2327	0.2327	0.3032	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7673	1
	TEST2	0.3032	0.3032	0.2327	2

Report for 3Stakeholders Designation

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7308	1.0000	1
	TEST2	0.3683	0.2692	0.3683	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1S Commitment	0.7465	1	1S Commitment	0.2535	2
2S Participation	0.6357	1	2S Participation	0.3643	2
3S Reasons for SISP	0.8680	1	3S Reasons for SISP	0.1320	2

Report for 3Stakeholders Designation->1S Commitment

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7465	0.7465	1.0000	1
	TEST2	0.2535	0.2535	0.3396	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7465	1
	TEST2	0.3396	0.3396	0.2535	2

Report for 3Stakeholders Designation->2S Participation

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.6357	0.6357	1.0000	1
	TEST2	0.3643	0.3643	0.5730	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6357	1
	TEST2	0.5730	0.5730	0.3643	2

Report for 3Stakeholders Designation->3S Reasons for SISP

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8680	0.8680	1.0000	1
	TEST2	0.1320	0.1320	0.1521	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8680	1
	TEST2	0.1521	0.1521	0.1320	2

Report for 4Technology

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.8457	1.0000	1
	TEST2	0.1825	0.1543	0.1825	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1T Applications	1.0000	1	1T Applications	0.0000	2
2T Infrastructure and Dependency on IT	0.7851	1	2T Infrastructure and Dependency on IT	0.2149	2

Report for 4Technology->1T Applications

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	1.0000	1.0000	1
	TEST2	0.0000	0.0000	0.0000	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	1.0000	1
	TEST2	0.0000	0.0000	0.0000	2

Report for 4Technology->2T Infrastructure and Dependency on IT

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7851	0.7851	1.0000	1
	TEST2	0.2149	0.2149	0.2737	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7851	1
	TEST2	0.2737	0.2737	0.2149	2

Report for 5Form and Content

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.6437	1.0000	1
	TEST2	0.5534	0.3563	0.5534	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1F Content	0.6717	1	1F Content	0.3283	2
2F SISP Approach	0.5330	1	2F SISP Approach	0.4670	2

Report for 5Form and Content->1F Content

Graphic	Alternatives	Total	Normal	Ideal	Ranking

	TEST1	0.6717	0.6717	1.0000	1
	TEST2	0.3283	0.3283	0.4888	2

Ratings Information

Not applicable

Report for 5Form and Content->2F SISP Approach

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.5330	0.5330	1.0000	1
	TEST2	0.4670	0.4670	0.8762	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.5330	1
	TEST2	0.8762	0.8762	0.4670	2

Report for 6Collaboration

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7819	1.0000	1
	TEST2	0.2789	0.2181	0.2789	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1C Alignment	0.7630	1	1C Alignment	0.2370	2
2C Communication	0.8925	1	2C Communication	0.1075	2

Report for 6Collaboration->1C Alignment

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7630	0.7630	1.0000	1
	TEST2	0.2370	0.2370	0.3106	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7630	1
	TEST2	0.3106	0.3106	0.2370	2

Report for 6Collaboration->2C Communication

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8925	0.8925	1.0000	1
	TEST2	0.1075	0.1075	0.1204	2

Ratings Information

Not applicable

Report for 7Time Dimension

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.7280	1.0000	1
	TEST2	0.3737	0.2720	0.3737	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1TD Planning Time Frame	0.6918	1	1TD Planning Time Frame	0.3082	2
2TD Frequency of Reviews	0.7291	1	2TD Frequency of Reviews	0.2709	2
3TD Frequency of Measurement	0.8117	1	3TD Frequency of Measurement	0.1883	2

Ratings Information

Report for 7Time Dimension->1TD Planning Time Frame

Graphic	Alternatives	Total	Normal	Ideal	Ranking

	TEST1	0.6918	0.6918	1.0000	1
	TEST2	0.3082	0.3082	0.4455	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6918	1
	TEST2	0.4455	0.4455	0.3082	2

Report for 7Time Dimension->2TD Frequency of Reviews

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7291	0.7291	1.0000	1
	TEST2	0.2709	0.2709	0.3716	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.7291	1
	TEST2	0.3716	0.3716	0.2709	2

Report for 7Time Dimension->3TD Frequency of Measurement

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8117	0.8117	1.0000	1
	TEST2	0.1883	0.1883	0.2320	2

Ratings Information

Not applicable

Report for 8Viability

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.6457	1.0000	1
	TEST2	0.5488	0.3543	0.5488	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
1VMeasurement	0.7405	1	1VMeasurement	0.2595	2
2VPractice	0.5724	1	2VPractice	0.4276	2

Report for 8Viability->1VMeasurement

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.7405	0.7405	1.0000	1
	TEST2	0.2595	0.2595	0.3504	2

Ratings Information

Not applicable

Report for 8Viability->2VPractice

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.5724	0.5724	1.0000	1
	TEST2	0.4276	0.4276	0.7471	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.5724	1
	TEST2	0.7471	0.7471	0.4276	2

Report for Benefit

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.6982	1.0000	1
	TEST2	0.4322	0.3018	0.4322	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
SISP Benefits	0.6982	1	SISP Benefits	0.3018	2

Report for Benefit->SISP Benefits

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.6982	0.6982	1.0000	1
	TEST2	0.3018	0.3018	0.4322	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6982	1
	TEST2	0.4322	0.4322	0.3018	2

Report for Costs

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.8302	1.0000	1
	TEST2	0.2045	0.1698	0.2045	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
SISP Costs	0.8302	1	SISP Costs	0.1698	2

Report for Costs->SISP Costs

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8302	0.8302	1.0000	1
	TEST2	0.1698	0.1698	0.2045	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8302	1
	TEST2	0.2045	0.2045	0.1698	2

Report for Opportunities

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.6682	1.0000	1
	TEST2	0.4966	0.3318	0.4966	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
Opportunities	0.6682	1	Opportunities	0.3318	2

Report for Opportunities->Opportunities

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.6682	0.6682	1.0000	1
	TEST2	0.3318	0.3318	0.4966	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.6682	1
	TEST2	0.4966	0.4966	0.3318	2

Report for Risks

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	1.0000	0.8106	1.0000	1
	TEST2	0.2337	0.1894	0.2337	2

How the alternatives fed forward

TEST1	Total Priority	Rank	TEST2	Total Priority	Rank
Uncertainties	0.8106	1	Uncertainties	0.1894	2

Ratings Information

This network had subnetworks. So the ratings system's values is used to set the values of $TotalRat(Node_With_Subnetwork), $NormalRat, and $IdealRat, used in any formula given.

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8123	1
	TEST2	0.2310	0.2310	0.1877	2

Report for Risks->Uncertainties

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	TEST1	0.8106	0.8106	1.0000	1
	TEST2	0.1894	0.1894	0.2337	2

Ratings Information

Graphic	Ratings Alternatives	Total	Ideal	Normal	Ranking
	TEST1	1.0000	1.0000	0.8106	1
	TEST2	0.2337	0.2337	0.1894	2

Assessment of SISP maturity level in all surveyed organisations:

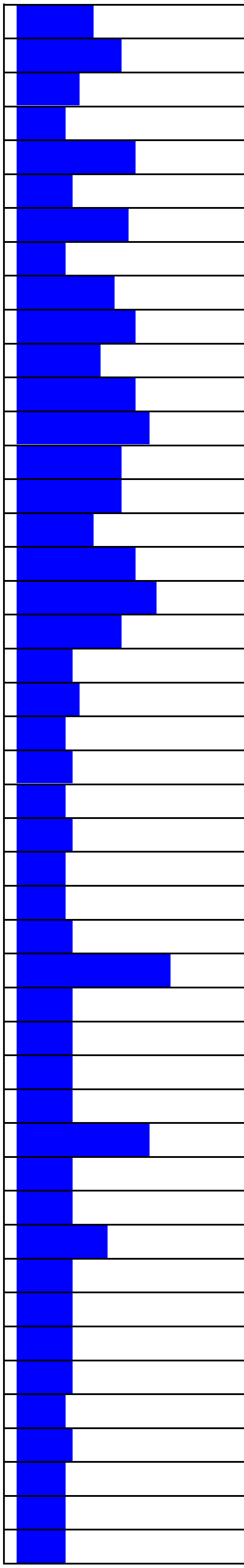
Table 0.1 Ranking of Surveyed Organizations in SISP Maturity Terms

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	1	0.4999	0.0050	0.4999	66
	2	0.5414	0.0055	0.5414	42
	3	0.5785	0.0058	0.5785	20
	4	0.5659	0.0057	0.5659	24
	5	0.5006	0.0051	0.5006	64
	6	0.6759	0.0068	0.6759	6
	7	0.4212	0.0042	0.4212	112
	8	0.5178	0.0052	0.5178	50
	9	0.6122	0.0062	0.6122	16
	10	0.4736	0.0048	0.4736	89
	11	0.5149	0.0052	0.5149	55
	12	0.4696	0.0047	0.4696	95
	13	0.2151	0.0022	0.2151	251
	14	0.1899	0.0019	0.1899	261
	15	0.4717	0.0048	0.4717	91
	16	0.5762	0.0058	0.5762	23
	17	0.4840	0.0049	0.4840	77
	18	0.4564	0.0046	0.4564	99
	19	0.3782	0.0038	0.3782	131
	20	0.4405	0.0044	0.4405	107
	21	0.3717	0.0038	0.3717	133
	22	0.5184	0.0052	0.5184	49
	23	0.6074	0.0061	0.6074	19
	24	0.5484	0.0055	0.5484	33
	25	0.4943	0.0050	0.4943	71
	26	0.4809	0.0049	0.4809	85
	27	0.4490	0.0045	0.4490	103
	28	0.5420	0.0055	0.5420	41
	29	0.5456	0.0055	0.5456	39
	30	0.4232	0.0043	0.4232	111
	31	0.5101	0.0051	0.5101	61
	32	0.4835	0.0049	0.4835	79
	33	0.3794	0.0038	0.3794	129
	34	0.2424	0.0024	0.2424	201
	35	0.4052	0.0041	0.4052	118
	36	0.4960	0.0050	0.4960	68
	37	0.6454	0.0065	0.6454	10
	38	0.5163	0.0052	0.5163	52
	39	0.2317	0.0023	0.2317	222
	40	0.3604	0.0036	0.3604	134
	41	0.4831	0.0049	0.4831	82
	42	0.4449	0.0045	0.4449	104

	43	0.5362	0.0054	0.5362	44
	44	0.4136	0.0042	0.4136	116
	45	0.4621	0.0047	0.4621	96
	46	0.2529	0.0026	0.2529	164
	47	0.2191	0.0022	0.2191	244
	48	0.2445	0.0025	0.2445	188
	49	0.5109	0.0052	0.5109	58
	50	0.3046	0.0031	0.3046	140
	51	0.3522	0.0036	0.3522	136
	52	0.4834	0.0049	0.4834	80
	53	0.2670	0.0027	0.2670	146
	54	0.2326	0.0023	0.2326	220
	55	0.5572	0.0056	0.5572	30
	56	0.2407	0.0024	0.2407	206
	57	0.5139	0.0052	0.5139	56
	58	0.2227	0.0022	0.2227	238
	59	0.4541	0.0046	0.4541	100
	60	0.5602	0.0057	0.5602	26
	61	0.3801	0.0038	0.3801	126
	62	0.5476	0.0055	0.5476	34
	63	0.6221	0.0063	0.6221	12
	64	0.4910	0.0050	0.4910	72
	65	0.4874	0.0049	0.4874	74
	66	0.3403	0.0034	0.3403	138
	67	0.5472	0.0055	0.5472	36
	68	0.6606	0.0067	0.6606	8
	69	0.4745	0.0048	0.4745	86
	70	0.2428	0.0024	0.2428	194
	71	0.2673	0.0027	0.2673	144
	72	0.2149	0.0022	0.2149	252
	73	0.2424	0.0024	0.2424	198
	74	0.2148	0.0022	0.2148	254
	75	0.2536	0.0026	0.2536	162
	76	0.2084	0.0021	0.2084	258
	77	0.2181	0.0022	0.2181	248
	78	0.2440	0.0025	0.2440	190
	79	0.7199	0.0073	0.7199	2
	80	0.2484	0.0025	0.2484	178
	81	0.2433	0.0025	0.2433	192
	82	0.2557	0.0026	0.2557	156
	83	0.2495	0.0025	0.2495	170
	84	0.6131	0.0062	0.6131	14
	85	0.2367	0.0024	0.2367	216
	86	0.2451	0.0025	0.2451	184
	87	0.4023	0.0041	0.4023	120
	88	0.2398	0.0024	0.2398	208

	89	0.2449	0.0025	0.2449	186
	90	0.2511	0.0025	0.2511	166
	91	0.2490	0.0025	0.2490	172
	92	0.2197	0.0022	0.2197	242
	93	0.2473	0.0025	0.2473	180
	94	0.2330	0.0024	0.2330	218
	95	0.2305	0.0023	0.2305	226
	96	0.2305	0.0023	0.2305	228
	97	0.2490	0.0025	0.2490	174
	98	0.2870	0.0029	0.2870	142
	99	0.2413	0.0024	0.2413	204
	100	0.2581	0.0026	0.2581	154
	101	0.2396	0.0024	0.2396	210
	102	0.5014	0.0051	0.5014	62
	103	0.3894	0.0039	0.3894	124
	104	0.6910	0.0070	0.6910	4
	105	0.2543	0.0026	0.2543	158
	106	0.3995	0.0040	0.3995	122
	107	0.2383	0.0024	0.2383	212
	108	0.2274	0.0023	0.2274	236
	109	0.2188	0.0022	0.2188	246
	110	0.2275	0.0023	0.2275	234
	111	0.2381	0.0024	0.2381	214
	112	0.4154	0.0042	0.4154	114
	113	0.2588	0.0026	0.2588	152
	114	0.2425	0.0024	0.2425	196
	115	0.2610	0.0026	0.2610	148
	116	0.5592	0.0056	0.5592	28
	117	0.2131	0.0021	0.2131	256
	118	0.2471	0.0025	0.2471	182
	119	0.2223	0.0022	0.2223	240
	120	0.2599	0.0026	0.2599	150
	121	0.4713	0.0048	0.4713	92
	122	0.2486	0.0025	0.2486	176
	123	0.4266	0.0043	0.4266	108
	124	0.2309	0.0023	0.2309	224
	125	0.2538	0.0026	0.2538	160
	126	0.2509	0.0025	0.2509	168
	127	0.5234	0.0053	0.5234	46
	128	0.2294	0.0023	0.2294	232
	129	0.2303	0.0023	0.2303	230
	130	0.2422	0.0024	0.2422	202
	131	0.4999	0.0050	0.4999	67
	132	0.5414	0.0055	0.5414	43
	133	0.5785	0.0058	0.5785	21
	134	0.5659	0.0057	0.5659	25

	135	0.5006	0.0051	0.5006	65
	136	0.6759	0.0068	0.6759	7
	137	0.4212	0.0042	0.4212	113
	138	0.5178	0.0052	0.5178	51
	139	0.6122	0.0062	0.6122	17
	140	0.4736	0.0048	0.4736	88
	141	0.5149	0.0052	0.5149	54
	142	0.4696	0.0047	0.4696	94
	143	0.2151	0.0022	0.2151	250
	144	0.1899	0.0019	0.1899	260
	145	0.4717	0.0048	0.4717	90
	146	0.5762	0.0058	0.5762	22
	147	0.4840	0.0049	0.4840	76
	148	0.4564	0.0046	0.4564	98
	149	0.3782	0.0038	0.3782	130
	150	0.4405	0.0044	0.4405	106
	151	0.3717	0.0038	0.3717	132
	152	0.5184	0.0052	0.5184	48
	153	0.6074	0.0061	0.6074	18
	154	0.5484	0.0055	0.5484	32
	155	0.4943	0.0050	0.4943	70
	156	0.4809	0.0049	0.4809	84
	157	0.4490	0.0045	0.4490	102
	158	0.5420	0.0055	0.5420	40
	159	0.5456	0.0055	0.5456	38
	160	0.4232	0.0043	0.4232	110
	161	0.5101	0.0051	0.5101	60
	162	0.4835	0.0049	0.4835	78
	163	0.3794	0.0038	0.3794	128
	164	0.2424	0.0024	0.2424	200
	165	0.4052	0.0041	0.4052	119
	166	0.4960	0.0050	0.4960	69
	167	0.6454	0.0065	0.6454	11
	168	0.5163	0.0052	0.5163	53
	169	0.2317	0.0023	0.2317	223
	170	0.3604	0.0036	0.3604	135
	171	0.4831	0.0049	0.4831	83
	172	0.4449	0.0045	0.4449	105
	173	0.5362	0.0054	0.5362	45
	174	0.4136	0.0042	0.4136	117
	175	0.4621	0.0047	0.4621	97
	176	0.2529	0.0026	0.2529	165
	177	0.2191	0.0022	0.2191	245
	178	0.2445	0.0025	0.2445	189
	179	0.5109	0.0052	0.5109	59
	180	0.3046	0.0031	0.3046	141



	181	0.3522	0.0036	0.3522	137
	182	0.4834	0.0049	0.4834	81
	183	0.2670	0.0027	0.2670	147
	184	0.2326	0.0023	0.2326	221
	185	0.5572	0.0056	0.5572	31
	186	0.2407	0.0024	0.2407	207
	187	0.5139	0.0052	0.5139	57
	188	0.2227	0.0022	0.2227	239
	189	0.4541	0.0046	0.4541	101
	190	0.5602	0.0057	0.5602	27
	191	0.3801	0.0038	0.3801	127
	192	0.5476	0.0055	0.5476	35
	193	0.6221	0.0063	0.6221	13
	194	0.4910	0.0050	0.4910	73
	195	0.4874	0.0049	0.4874	75
	196	0.3403	0.0034	0.3403	139
	197	0.5472	0.0055	0.5472	37
	198	0.6606	0.0067	0.6606	9
	199	0.4745	0.0048	0.4745	87
	200	0.2428	0.0024	0.2428	195
	201	0.2673	0.0027	0.2673	145
	202	0.2149	0.0022	0.2149	253
	203	0.2424	0.0024	0.2424	199
	204	0.2148	0.0022	0.2148	255
	205	0.2536	0.0026	0.2536	163
	206	0.2084	0.0021	0.2084	259
	207	0.2181	0.0022	0.2181	249
	208	0.2440	0.0025	0.2440	191
	209	0.7199	0.0073	0.7199	3
	210	0.2484	0.0025	0.2484	179
	211	0.2433	0.0025	0.2433	193
	212	0.2557	0.0026	0.2557	157
	213	0.2495	0.0025	0.2495	171
	214	0.6131	0.0062	0.6131	15
	215	0.2367	0.0024	0.2367	217
	216	0.2451	0.0025	0.2451	185
	217	0.4023	0.0041	0.4023	121
	218	0.2398	0.0024	0.2398	209
	219	0.2449	0.0025	0.2449	187
	220	0.2511	0.0025	0.2511	167
	221	0.2490	0.0025	0.2490	173
	222	0.2197	0.0022	0.2197	243
	223	0.2473	0.0025	0.2473	181
	224	0.2330	0.0024	0.2330	219
	225	0.2305	0.0023	0.2305	227
	226	0.2305	0.0023	0.2305	229

	227	0.2490	0.0025	0.2490	175
	228	0.2870	0.0029	0.2870	143
	229	0.2413	0.0024	0.2413	205
	230	0.2581	0.0026	0.2581	155
	231	0.2396	0.0024	0.2396	211
	232	0.5014	0.0051	0.5014	63
	233	0.3894	0.0039	0.3894	125
	234	0.6910	0.0070	0.6910	5
	235	0.2543	0.0026	0.2543	159
	236	0.3995	0.0040	0.3995	123
	237	0.2383	0.0024	0.2383	213
	238	0.2274	0.0023	0.2274	237
	239	0.2188	0.0022	0.2188	247
	240	0.2275	0.0023	0.2275	235
	241	0.2381	0.0024	0.2381	215
	242	0.4154	0.0042	0.4154	115
	243	0.2588	0.0026	0.2588	153
	244	0.2425	0.0024	0.2425	197
	245	0.2610	0.0026	0.2610	149
	246	0.5592	0.0056	0.5592	29
	247	0.2131	0.0021	0.2131	257
	248	0.2471	0.0025	0.2471	183
	249	0.2223	0.0022	0.2223	241
	250	0.2599	0.0026	0.2599	151
	251	0.4713	0.0048	0.4713	93
	252	0.2486	0.0025	0.2486	177
	253	0.4266	0.0043	0.4266	109
	254	0.2309	0.0023	0.2309	225
	255	0.2538	0.0026	0.2538	161
	256	0.2509	0.0025	0.2509	169
	257	0.5234	0.0053	0.5234	47
	258	0.2294	0.0023	0.2294	233
	259	0.2303	0.0023	0.2303	231
	260	0.2422	0.0024	0.2422	203
	TEST1	1.0000	0.0101	1.0000	1

Appendix E

Table 0.1 Reliability and PCA Summary for Scales Used for Statistical Analysis

Description	No of Items	Alpha/ Standard alpha	KMO	Total variance explained	Note
Q10-12 Size of Company	3	.867	.69	79.1%	Factor: Q10-12_f1
Q14 Organization Profile	4	.70	.66	53.2%	Items dropped: Q14.5-7 Factor: F14_1
Q15 Technology	10	.779	.725	60.7%	Factors: F15_1 (5) F15_2(3) F15_3(2)
Q16 Perceived function of SISP	3	.585	.623	54.12%	Items dropped: Q16.1-5 Factor: F16_f1
Q17 Available IS skills	8	.75	.74	54.6%	Items dropped: Q17.6-8, 12 Factors: F17_1(5) F17_2(3)
Q19 Planning Horizon	3	.65	.64	58.9%	Factors: F19_1
Q20 SISP team has adequate skills	5	.96	.90	82.75%	Items dropped: Q20.4 Factor: F20_1
Q21 SISP approach	5	.804	.80	56.7%	Factor: F21_1
Q22 SISP planning style	4	.687	.64	52.5%	F22_1
Q22 SISP methodologies	10	.846	.76	57.5%	Factors: F22_2(7) F22_3(3)
Q24 SISP participants	10	.83	.78	70.2%	Items dropped: Q24.5, Q24.10 Factors: F24_1(4) F24_2 (3) F24_3(3)
Q25 SISP initiators	9	.67	.55	61.7%	Items dropped: Q25.4, Q25.6 Factor: Q25_f1(4) Q25_f2(3) Q25_f3(2)
Q26 Commitment toward the SISP formulation	5	.86	.81	64.3%	Factor: f26_1
Q27 Source of expertise	7	.707 .	.70	56.2%	Factor: f27_1(4) f27_2(3)

Description	**No of Items**	**Alpha/ Standard alpha**	**KMO**	**Total variance explained**	**Note**
Q28 +Q19 SISP content	6	.797	.79	55.23%	Items dropped: Q28.4 Factors: F28_1
Q29 Change reviews	7	.75	.74	60.9%	Factor: f29_1(4) f29_2(3)
Q30 Learning Review	4	.96	.83	89.1%	Factor: F30_1
Q31 Reason for SISP	7	.79 .	.80	63.1%	Items dropped: Q31.5,7 Factors: F31_1(4) F31_2(3)
Q32 SISP objectives	11	.928	.89	58.55%	Items dropped: Q32.3 &4, Q32.13&14 Factor: F32_1
Q33 SISP policy	8	.963	.92	79.45%	Factors: F33_1
Q34 SISP focus	3	.869	.71	79.22%	Factors: F33_1
Q35 SISP concerns	9	.849	.78	45.69%	Items dropped: Q35.1-3, 5,8,15 Factors: F35_1
Q36 SISP Alignment with business planning	9	.884	.86	66.23%	Items dropped: Q36.2,8,9,13 Factors: F36_1 F36_2
Q37 SISP Links	4	.978	.64	51.8%	Factors: F37_1
Q38 SISP formulation failure	21	.983	.88	75.3%	Factors: F38_1
Q39 SISP implementation failure	19	.986	.79	79.9%	Items dropped: Q39.8,9,19,20 Factors: F39_1
Q40 SISP external environment	7	.848 .	.70	69%	Items dropped: Q49.4 Factors: F40_1(3) F40_2(4)
Q41 SISP benefits	13	.969	.91	73.2%	Items dropped: Q41.7 Factors: F41_1
Q42 SISP success	5	.872	.78	66.9%	Factor: F42_1

Description	**No of Items**	**Alpha/ Standard alpha**	**KMO**	**Total variance explained**	**Note**
Q43 SISP measurement methodologies	12	.725	.64	62.9%	Factors: F43_1 (4) F43_2 (4) F43_3 (3)
Q44 SISP measurement frequency	4	.610 .	.67	52.0%	Factor: F44_1
Q45 SISP measurement levels	7	.559	.79	71.3%	Factor: F45_1(5) F45_2 (2)
Q46 Measurement of SISP	5	.651	.71	42.2%	Items dropped: Q46.4-10 Factor: F46_1
Q47 Measurement Objectives	6	.683	.75	56.5%	Factor: F47_1
Q48 SISP Measurement Success	2	.888 .	.50	80.7%	Factor: F48_1
Q48 SISP Measurement benefits	3	.849	.50	76.1%	Factor: F48_2

Bartlett's Test of Sphericity positive and large, significance=0.000
Determinant of R-matrix <.00001

Appendix F

SISP Maturity Model: Respecified Six – Factor Measurement Model Analysis

Analysis Summary
Date and Time

Date: Tuesday, 18 July 2006
Time: 11:12:11 PM
Title
SISP Maturity Model

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
Q45.7	1.000	2.000	-.015	-.101	-2.000	-6.582
Q20.5	.000	1.000	1.878	12.366	1.529	5.031
Q23.1	.000	1.000	2.094	13.781	2.383	7.843
Q28.4	1.000	5.000	-.409	-2.692	.594	1.954
Q28.1	1.000	5.000	-.289	-1.902	.797	2.623
Q26.2	1.000	5.000	-.287	-1.888	-1.019	-3.353
Q24.4	1.000	5.000	-.261	-1.721	-.947	-3.116
Q30.4	1.000	2.000	.311	2.050	-1.903	-6.264
Q18.5	.000	1.000	-.955	-6.284	-1.089	-3.583
Q44.5	.000	1.000	-1.063	-6.996	-.871	-2.866
Q36.3	1.000	5.000	-.155	-1.021	.708	2.330
Q36.4	1.000	5.000	-.337	-2.219	1.309	4.309
Multivariate					23.398	10.291

Sample Covariances (Group number 1)

	Q45.7	Q20.5	Q23.1	Q28.4	Q28.1	Q26.2	Q24.4	Q30.4	Q18.5	Q44.5	Q36.3	Q36.4
Q45.7	.250											
Q20.5	.009	.133										
Q23.1	.034	.055	.119									
Q28.4	.036	.066	.038	.814								
Q28.1	.047	.039	.039	.407	.746							
Q26.2	.193	.094	.077	.318	.207	1.379						
Q24.4	.182	.098	.055	.158	.143	.825	1.179					
Q30.4	.118	.026	.026	.067	.099	.162	.122	.244				
Q18.5	.036	.003	.024	.060	.086	.068	.076	.017	.204			
Q44.5	.026	.015	.025	.099	.090	.071	.073	.012	.086	.195		
Q36.3	.018	.054	.042	.133	.206	.082	.077	.068	.062	.059	.732	
Q36.4	.049	.053	.054	.099	.186	.210	.146	.056	.067	.044	.386	.743

Condition number = 39.177
Eigenvalues
2.488 1.243 .857 .462 .366 .333 .287 .249 .158 .120 .110 .063
Determinant of sample covariance matrix = .000
Sample Correlations (Group number 1)

	Q45.7	Q20.5	Q23.1	Q28.4	Q28.1	Q26.2	Q24.4	Q30.4	Q18.5	Q44.5	Q36.3	Q36.4
Q45.7	1.000											
Q20.5	.049	1.000										
Q23.1	.197	.438	1.000									
Q28.4	.080	.201	.122	1.000								
Q28.1	.110	.125	.130	.523	1.000							
Q26.2	.329	.220	.189	.300	.205	1.000						
Q24.4	.335	.248	.147	.162	.153	.647	1.000					
Q30.4	.476	.142	.153	.150	.233	.279	.227	1.000				
Q18.5	.158	.016	.154	.147	.220	.129	.154	.074	1.000			
Q44.5	.118	.093	.165	.249	.236	.136	.151	.056	.432	1.000		

	Q45.7	Q20.5	Q23.1	Q28.4	Q28.1	Q26.2	Q24.4	Q30.4	Q18.5	Q44.5	Q36.3	Q36.4
Q36.3	.042	.174	.141	.172	.278	.082	.083	.162	.160	.156	1.000	
Q36.4	.114	.170	.181	.127	.250	.208	.156	.131	.173	.115	.524	1.000

Condition number = 10.514
Eigenvalues
3.176 1.538 1.266 1.142 1.101 .978 .599 .545 .464 .447 .441 .302

Notes for Model (SISP six-factor measurement model - respecified)

Computation of degrees of freedom (SISP six-factor measurement model - respecified)

Number of distinct sample moments:	78
Number of distinct parameters to be estimated:	40
Degrees of freedom (78 - 40):	38

Result (SISP six-factor measurement model - respecified)

Minimum was achieved
Chi-square = 52.428
Degrees of freedom = 38
Probability level = .060

Estimates (Group number 1 - SISP six-factor measurement model - respecified)

Scalar Estimates (Group number 1 - SISP six-factor measurement model - respecified)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate	S.E.	C.R.	P	Label
Q44.5	<---	Time_Dimension	1.065	.257	4.146	***	par_1
Q30.4	<---	Technology	1.000				
Q20.5	<---	Form & Content	1.000				
Q23.1	<---	Form & Content	.964	.274	3.519	***	par_2
Q28.1	<---	Viability	1.000				
Q28.4	<---	Viability	.813	.157	5.175	***	par_3
Q24.4	<---	Stakeholders'_Designation	1.000				
Q26.2	<---	Stakeholders'_Designation	1.150	.152	7.585	***	par_4
Q36.3	<---	Collaboration	1.000				
Q36.4	<---	Collaboration	1.006	.209	4.817	***	par_5
Q18.5	<---	Time_Dimension	1.000				
Q45.7	<---	Technology	1.150	.240	4.794	***	par_6

Standardized Regression Weights: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate
Q44.5	<---	Time_Dimension	.685
Q30.4	<---	Technology	.647
Q20.5	<---	Form & Content	.656
Q23.1	<---	Form & Content	.667
Q28.1	<---	Viability	.815
Q28.4	<---	Viability	.636
Q24.4	<---	Stakeholders'_Designation	.777
Q26.2	<---	Stakeholders'_Designation	.829
Q36.3	<---	Collaboration	.724
Q36.4	<---	Collaboration	.723
Q18.5	<---	Time_Dimension	.630
Q45.7	<---	Technology	.736

Covariances: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate	S.E.	C.R.	P	Label
Form & Content	<-->	Collaboration	.051	.018	2.931	.003	par_7
Time_Dimension	<-->	Form & Content	.017	.007	2.363	.018	par_8
Form & Content	<-->	Viability	.046	.018	2.557	.011	par_9
Technology	<-->	Form & Content	.022	.009	2.589	.010	par_10
Time_Dimension	<-->	Stakeholders'_Designation	.062	.025	2.519	.012	par_11
Viability	<-->	Stakeholders'_Designation	.173	.051	3.376	***	par_12
Technology	<-->	Stakeholders'_Designation	.145	.031	4.603	***	par_13
Time_Dimension	<-->	Collaboration	.055	.021	2.641	.008	par_14
Viability	<-->	Collaboration	.181	.048	3.733	***	par_15

			Estimate	S.E.	C.R.	P	Label
Technology	<-->	Collaboration	.041	.021	1.971	.049	par_16
Technology	<-->	Viability	.061	.026	2.373	.018	par_17
Time_Dimension	<-->	Technology	.021	.010	2.103	.035	par_18
Form & Content	<-->	Stakeholders'_Designation	.074	.025	2.955	.003	par_19
Stakeholders'_Designation	<-->	Collaboration	.125	.046	2.744	.006	par_20
Time_Dimension	<-->	Viability	.089	.023	3.907	***	par_21
e6	<-->	e12	.131	.043	3.021	.003	par_22

Correlations: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate
Form & Content	<-->	Collaboration	.347
Time_Dimension	<-->	Form & Content	.253
Form & Content	<-->	Viability	.275
Technology	<-->	Form & Content	.290
Time_Dimension	<-->	Stakeholders'_Designation	.261
Viability	<-->	Stakeholders'_Designation	.292
Technology	<-->	Stakeholders'_Designation	.537
Time_Dimension	<-->	Collaboration	.313
Viability	<-->	Collaboration	.415
Technology	<-->	Collaboration	.209
Technology	<-->	Viability	.272
Time_Dimension	<-->	Technology	.231
Form & Content	<-->	Stakeholders'_Designation	.366
Stakeholders'_Designation	<-->	Collaboration	.239
Time_Dimension	<-->	Viability	.444
e6	<-->	e12	.288

Variances: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate	S.E.	C.R.	P	Label
Time_Dimension			.081	.024	3.414	***	par_23
Technology			.102	.027	3.819	***	par_24
Form & Content			.057	.019	3.081	.002	par_25
Viability			.495	.108	4.579	***	par_26
Stakeholders'_Designation			.711	.127	5.590	***	par_27
Collaboration			.384	.095	4.049	***	par_28
e4			.354	.083	4.264	***	par_29
e3			.348	.082	4.248	***	par_30
e10			.103	.023	4.448	***	par_31
e9			.123	.022	5.650	***	par_32
e7			.142	.024	5.955	***	par_33
e5			.468	.094	4.984	***	par_34
e6			.429	.118	3.617	***	par_35
e11			.250	.092	2.737	.006	par_36
e12			.483	.073	6.654	***	par_37
e2			.066	.016	4.175	***	par_38
e8			.115	.029	3.998	***	par_39
e1			.076	.017	4.395	***	par_40

Squared Multiple Correlations: (Group number 1 - SISP six-factor measurement model - respecified)

			Estimate
Q45.7			.541
Q20.5			.430
Q23.1			.445
Q28.4			.404
Q28.1			.664
Q26.2			.687
Q24.4			.603
Q30.4			.419

			Estimate
Q18.5			.397
Q44.5			.470
Q36.3			.524
Q36.4			.523

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
SISP six-factor measurement model - respecified	40	52.428	38	.060	1.380
Saturated model	78	.000	0		
Independence model	12	693.628	66	.000	10.510

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
SISP six-factor measurement model - respecified	.018	.967	.932	.471
Saturated model	.000	1.000		
Independence model	.145	.635	.569	.538

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
SISP six-factor measurement model - respecified	.924	.869	.978	.960	.977
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
SISP six-factor measurement model - respecified	.576	.532	.563
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
SISP six-factor measurement model - respecified	14.428	.000	37.564
Saturated model	.000	.000	.000
Independence model	627.628	546.759	715.945

FMIN

Model	FMIN	F0	LO 90	HI 90
SISP six-factor measurement model - respecified	.202	.056	.000	.145
Saturated model	.000	.000	.000	.000
Independence model	2.678	2.423	2.111	2.764

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
SISP six-factor measurement model - respecified	.038	.000	.062	.772
Independence model	.192	.179	.205	.000

AIC

Model	AIC	BCC	BIC	CAIC
SISP six-factor measurement model - respecified	132.428	136.656	274.855	314.855
Saturated model	156.000	164.244	433.733	511.733
Independence model	717.628	718.896	760.356	772.356

ECVI

Model	ECVI	LO 90	HI 90	MECVI
SISP six-factor measurement model - respecified	.511	.456	.601	.528
Saturated model	.602	.602	.602	.634
Independence model	2.771	2.459	3.112	2.776

HOELTER

Model	HOELTER .05	HOELTER .01
SISP six-factor measurement model - respecified	264	303
Independence model	33	36

SISP Maturity Model: Full Structural Equation Model Analysis
Analysis Summary
Date and Time
Date: Tuesday, 18 July 2006
Time: 11:35:10 PM
Title
SISP structural model: Tuesday, 18 July 2006 11:35 PM
Notes for Group (Group number 1)
The model is recursive.
Sample size Variable Summary (Group number 1)
Your model contains the following variables (Group number 1)
Observed, endogenous variables
Q28.4, Q28.1, Q23.1, Q20.5, Q30.4, Q18.5, Q44.5, Q36.3, Q36.4, Q24.4, Q26.2, Q45.7
Unobserved, endogenous variables
Form & Content
Technology
Viability
Efficiency
Manoeuvrability
Effectiveness
Stakeholders'_Designation
Collaboration
Time_Dimension
Unobserved, exogenous variables
e12, e11, e2, e1,e7, e9, e10, d1, d6, SISP, r2, r3, r1, e3, e4, e5, e6, d4, e8, d5, d2, d3

Variable counts (Group number 1)

Number of variables in your model:	43
Number of observed variables:	12
Number of unobserved variables:	31
Number of exogenous variables:	22
Number of endogenous variables:	21

= 260

Parameter summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	31	0	0	0	0	31
Labeled	0	0	0	0	0	0
Unlabeled	11	1	22	0	0	34
Total	42	1	22	0	0	65

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
Q45.7	1.000	2.000	-.015	-.101	-2.000	-6.582
Q26.2	1.000	5.000	-.287	-1.888	-1.019	-3.353
Q24.4	1.000	5.000	-.261	-1.721	-.947	-3.116
Q36.4	1.000	5.000	-.337	-2.219	1.309	4.309
Q36.3	1.000	5.000	-.155	-1.021	.708	2.330
Q44.5	.000	1.000	-1.063	-6.996	-.871	-2.866
Q18.5	.000	1.000	-.955	-6.284	-1.089	-3.583
Q30.4	1.000	2.000	.311	2.050	-1.903	-6.264
Q20.5	.000	1.000	1.878	12.366	1.529	5.031
Q23.1	.000	1.000	2.094	13.781	2.383	7.843
Q28.1	1.000	5.000	-.289	-1.902	.797	2.623
Q28.4	1.000	5.000	-.409	-2.692	.594	1.954
Multivariate					23.398	10.291

Sample Moments (Group number 1)

Sample Covariances (Group number 1)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	.250											
Q26.2	.193	1.379										
Q24.4	.182	.825	1.179									
Q36.4	.049	.210	.146	.743								
Q36.3	.018	.082	.077	.386	.732							
Q44.5	.026	.071	.073	.044	.059	.195						
Q18.5	.036	.068	.076	.067	.062	.086	.204					
Q30.4	.118	.162	.122	.056	.068	.012	.017	.244				
Q20.5	.009	.094	.098	.053	.054	.015	.003	.026	.133			
Q23.1	.034	.077	.055	.054	.042	.025	.024	.026	.055	.119		
Q28.1	.047	.207	.143	.186	.206	.090	.086	.099	.039	.039	.746	
Q28.4	.036	.318	.158	.099	.133	.099	.060	.067	.066	.038	.407	.814

Condition number = 39.177
Eigenvalues
2.488 1.243 .857 .462 .366 .333 .287 .249 .158 .120 .110 .063
Determinant of sample covariance matrix = .000

Sample Correlations (Group number 1)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	1.000											
Q26.2	.329	1.000										
Q24.4	.335	.647	1.000									
Q36.4	.114	.208	.156	1.000								
Q36.3	.042	.082	.083	.524	1.000							
Q44.5	.118	.136	.151	.115	.156	1.000						
Q18.5	.158	.129	.154	.173	.160	.432	1.000					
Q30.4	.476	.279	.227	.131	.162	.056	.074	1.000				
Q20.5	.049	.220	.248	.170	.174	.093	.016	.142	1.000			
Q23.1	.197	.189	.147	.181	.141	.165	.154	.153	.438	1.000		
Q28.1	.110	.205	.153	.250	.278	.236	.220	.233	.125	.130	1.000	
Q28.4	.080	.300	.162	.127	.172	.249	.147	.150	.201	.122	.523	1.000

Condition number = 10.514
Eigenvalues
3.176 1.538 1.266 1.142 1.101 .978 .599 .545 .464 .447 .441 .302

Notes for Model (SISP Maturity - Full SAM Model)

Computation of degrees of freedom (SISP Maturity - Full SAM Model)

Number of distinct sample moments:	78
Number of distinct parameters to be estimated:	34
Degrees of freedom (78 - 34):	44

Result (SISP Maturity - Full SAM Model)
Minimum was achieved
Chi-square = 56.157
Degrees of freedom = 44
Probability level = .103

Estimates (Group number 1 - SISP Maturity - Full SAM Model)

Scalar Estimates (Group number 1 - SISP Maturity - Full SAM Model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate	S.E.	C.R.	P	Label
Efficiency	<---	SISP	3.187	.997	3.197	.001	par_2
Maneuverability	<---	SISP	1.029	.447	2.301	.021	par_3
Effectiveness	<---	SISP	1.000				
Stakeholders'_Designation	<---	Efficiency	1.000				

			Estimate	S.E.	C.R.	P	Label
Form & Content	<---	Effectiveness	1.000				
Technology	<---	Efficiency	.329	.105	3.124	.002	par_9
Viability	<---	Maneuverability	2.922	.891	3.277	.001	par_10
Time_Dimension	<---	Maneuverability	1.000				
Collaboration	<---	Effectiveness	2.544	.843	3.017	.003	par_11
Q23.1	<---	Form & Content	.999	.248	4.022	***	par_1
Q30.4	<---	Technology	1.000				
Q24.4	<---	Stakeholders'_Designation	1.000				
Q26.2	<---	Stakeholders'_Designation	1.180	.154	7.670	***	par_4
Q36.3	<---	Collaboration	1.000				
Q36.4	<---	Collaboration	1.119	.235	4.760	***	par_5
Q18.5	<---	Time_Dimension	1.000				
Q44.5	<---	Time_Dimension	1.094	.261	4.200	***	par_6
Q28.1	<---	Viability	1.000				
Q28.4	<---	Viability	.878	.163	5.378	***	par_7
Q20.5	<---	Form & Content	1.000				
Q45.7	<---	Technology	1.150	.223	5.169	***	par_8

Standardized Regression Weights: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate
Efficiency	<---	SISP	.653
Maneuverability	<---	SISP	.809
Effectiveness	<---	SISP	.986
Stakeholders'_Designation	<---	Efficiency	.790
Form & Content	<---	Effectiveness	.583
Technology	<---	Efficiency	.678
Viability	<---	Maneuverability	.740
Time_Dimension	<---	Maneuverability	.613
Collaboration	<---	Effectiveness	.593
Q23.1	<---	Form & Content	.679
Q30.4	<---	Technology	.647
Q24.4	<---	Stakeholders'_Designation	.768
Q26.2	<---	Stakeholders'_Designation	.839
Q36.3	<---	Collaboration	.687
Q36.4	<---	Collaboration	.763
Q18.5	<---	Time_Dimension	.621
Q44.5	<---	Time_Dimension	.695
Q28.1	<---	Viability	.786
Q28.4	<---	Viability	.661
Q20.5	<---	Form & Content	.644
Q45.7	<---	Technology	.736

Covariances: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate	S.E.	C.R.	P	Label
e12	<-->	e6	.130	.043	3.027	.002	par_12

Correlations: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate
e12	<-->	e6	.301

Variances: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate	S.E.	C.R.	P	Label
SISP			.018	.009	1.946	.052	par_13
r2			.249	.117	2.124	.034	par_14
r3			.010	.008	1.339	.181	par_15

			Estimate	S.E.	C.R.	P	Label
r1			.001	.006	.086	.931	par_16
d1			.036	.012	2.934	.003	par_17
d6			.208	.092	2.274	.023	par_18
d4			.055	.018	3.087	.002	par_19
d5			.049	.017	2.955	.003	par_20
d2			.224	.066	3.377	***	par_21
d3			.261	.118	2.207	.027	par_22
e12			.457	.074	6.209	***	par_23
e11			.286	.084	3.410	***	par_24
e2			.064	.014	4.452	***	par_25
e1			.078	.015	5.197	***	par_26
e7			.142	.022	6.318	***	par_27
e9			.125	.021	5.907	***	par_28
e10			.101	.023	4.307	***	par_29
e3			.387	.077	5.022	***	par_30
e4			.310	.091	3.419	***	par_31
e5			.483	.092	5.244	***	par_32
e6			.407	.119	3.413	***	par_33
e8			.115	.027	4.300	***	par_34

Squared Multiple Correlations: (Group number 1 - SISP Maturity - Full SAM Model)

			Estimate
Effectiveness			.972
Maneuverability			.654
Efficiency			.426
Time_Dimension			.375
Collaboration			.352
Stakeholders'_Designation			.624
Viability			.547
Technology			.460
Form & Content			.340
Q45.7			.541
Q26.2			.704
Q24.4			.590
Q36.4			.582
Q36.3			.471
Q44.5			.483
Q18.5			.386
Q30.4			.419
Q20.5			.415
Q23.1			.461
Q28.1			.617
Q28.4			.437

Matrices (Group number 1 - SISP Maturity - Full SAM Model)

Implied (for all variables) Covariances (Group number 1 - SISP Maturity - Full SAM Model)

	SISP	Effectiveness	Maneuverability	Efficiency	Time_Dimension	Collaboration	Stakeholders'_Designation	Viability	Technology	Form & Content	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
SISP	.018																					
Effectiveness	.018	.019																				
Manoeuvrability	.019	.019	.029																			
Efficiency	.058	.058	.060	.434																		
Time_Dimension	.019	.019	.029	.060	.079																	
Collaboration	.046	.048	.048	.148	.048	.345																
Stakeholders'_Designation	.058	.058	.060	.434	.060	.148	.696															
Viability	.055	.055	.086	.175	.086	.139	.175	.460														
Technology	.019	.019	.020	.143	.020	.049	.143	.057	.102													
Form & Content	.018	.019	.019	.058	.019	.048	.058	.055	.019	.055												
Q45.7	.022	.022	.023	.164	.023	.056	.164	.066	.118	.022	.250											
Q26.2	.068	.068	.070	.512	.070	.174	.821	.206	.169	.068	.194	1.376										
Q24.4	.058	.058	.060	.434	.060	.148	.696	.175	.143	.058	.164	.821	1.179									
Q36.4	.052	.053	.053	.165	.053	.386	.165	.156	.054	.053	.063	.195	.165	.743								
Q36.3	.046	.048	.048	.148	.048	.345	.148	.139	.049	.048	.056	.174	.148	.386	.732							
Q44.5	.021	.021	.032	.065	.086	.052	.065	.094	.022	.021	.025	.077	.065	.058	.052	.195						
Q18.5	.019	.019	.029	.060	.079	.048	.060	.086	.020	.019	.023	.070	.060	.053	.048	.086	.204					
Q30.4	.019	.019	.020	.143	.020	.049	.143	.057	.102	.019	.118	.169	.143	.054	.049	.022	.020	.244				
Q20.5	.018	.019	.019	.058	.019	.048	.058	.055	.019	.055	.022	.068	.058	.053	.048	.021	.019	.019	.133			
Q23.1	.018	.019	.019	.058	.019	.048	.058	.055	.019	.055	.022	.068	.058	.053	.048	.020	.019	.019	.055	.119		
Q28.1	.055	.055	.086	.175	.086	.139	.175	.460	.057	.055	.066	.206	.175	.156	.139	.094	.086	.057	.055	.055	.746	
Q28.4	.048	.048	.076	.153	.076	.122	.153	.404	.050	.048	.058	.311	.153	.137	.122	.083	.076	.050	.048	.048	.404	.812

Implied (for all variables) Correlations (Group number 1 - SISP Maturity - Full SAM Model)

	SISP	Effectiveness	Manoeuvrability	Efficiency	Time_Dimension	Collaboration	Stakeholders'_Designation	Viability	Technology	Form & Content	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
SISP	1.000																					
Effectiveness	.986	1.000																				
Manoeuvrability	.809	.797	1.000																			
Efficiency	.653	.643	.528	1.000																		
Time_Dimension	.495	.488	.613	.323	1.000																	
Collaboration	.585	.593	.473	.382	.290	1.000																
Stakeholders'_Designation	.516	.508	.417	.790	.255	.301	1.000															
Viability	.598	.590	.740	.390	.453	.350	.308	1.000														
Technology	.443	.436	.358	.678	.219	.259	.536	.265	1.000													
Form & Content	.575	.583	.465	.375	.285	.346	.296	.344	.254	1.000												
Q45.7	.326	.321	.263	.499	.161	.190	.394	.195	.736	.187	1.000											
Q26.2	.433	.426	.350	.663	.214	.253	.839	.259	.450	.249	.331	1.000										
Q24.4	.396	.390	.320	.607	.196	.232	.768	.237	.412	.228	.303	.644	1.000									
Q36.4	.446	.452	.361	.291	.221	.763	.230	.267	.197	.264	.145	.193	.177	1.000								
Q36.3	.401	.407	.325	.262	.199	.687	.207	.240	.178	.237	.131	.174	.159	.524	1.000							
Q44.5	.344	.339	.426	.225	.695	.201	.177	.315	.152	.198	.112	.149	.136	.153	.138	1.000						
Q18.5	.308	.303	.381	.201	.621	.180	.159	.281	.136	.177	.100	.133	.122	.137	.124	.432	1.000					
Q30.4	.287	.282	.232	.439	.142	.167	.347	.171	.647	.165	.476	.291	.266	.128	.115	.099	.088	1.000				
Q20.5	.370	.376	.299	.242	.183	.223	.191	.221	.164	.644	.121	.160	.147	.170	.153	.127	.114	.106	1.000			
Q23.1	.390	.396	.316	.255	.193	.235	.201	.234	.173	.679	.127	.169	.155	.179	.161	.134	.120	.112	.438	1.000		
Q28.1	.470	.463	.581	.307	.356	.275	.242	.786	.208	.270	.153	.203	.186	.210	.189	.247	.221	.135	.174	.183	1.000	
Q28.4	.396	.390	.489	.258	.300	.231	.204	.661	.175	.227	.129	.294	.157	.176	.159	.208	.186	.113	.146	.154	.519	1.000

Implied Covariances (Group number 1 - SISP Maturity - Full SAM Model)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	.250											
Q26.2	.194	1.376										
Q24.4	.164	.821	1.179									
Q36.4	.063	.195	.165	.743								
Q36.3	.056	.174	.148	.386	.732							
Q44.5	.025	.077	.065	.058	.052	.195						
Q18.5	.023	.070	.060	.053	.048	.086	.204					
Q30.4	.118	.169	.143	.054	.049	.022	.020	.244				
Q20.5	.022	.068	.058	.053	.048	.021	.019	.019	.133			
Q23.1	.022	.068	.058	.053	.048	.020	.019	.019	.055	.119		
Q28.1	.066	.206	.175	.156	.139	.094	.086	.057	.055	.055	.746	
Q28.4	.058	.311	.153	.137	.122	.083	.076	.050	.048	.048	.404	.812

Implied Correlations (Group number 1 - SISP Maturity - Full SAM Model)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	1.000											
Q26.2	.331	1.000										
Q24.4	.303	.644	1.000									
Q36.4	.145	.193	.177	1.000								
Q36.3	.131	.174	.159	.524	1.000							
Q44.5	.112	.149	.136	.153	.138	1.000						
Q18.5	.100	.133	.122	.137	.124	.432	1.000					
Q30.4	.476	.291	.266	.128	.115	.099	.088	1.000				
Q20.5	.121	.160	.147	.170	.153	.127	.114	.106	1.000			
Q23.1	.127	.169	.155	.179	.161	.134	.120	.112	.438	1.000		
Q28.1	.153	.203	.186	.210	.189	.247	.221	.135	.174	.183	1.000	
Q28.4	.129	.294	.157	.176	.159	.208	.186	.113	.146	.154	.519	1.000

Residual Covariances (Group number 1 - SISP Maturity - Full SAM Model)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	.000											
Q26.2	-.001	.003										
Q24.4	.018	.004	.000									
Q36.4	-.013	.015	-.020	.000								
Q36.3	-.038	-.092	-.070	.000	.000							
Q44.5	.001	-.006	.007	-.015	.007	.000						
Q18.5	.013	-.002	.016	.014	.014	.000	.000					
Q30.4	.000	-.007	-.021	.001	.020	-.009	-.003	.000				
Q20.5	-.013	.026	.040	.000	.007	-.006	-.016	.006	.000			
Q23.1	.012	.008	-.003	.000	-.006	.005	.005	.007	.000	.000		
Q28.1	-.019	.002	-.031	.030	.066	-.004	-.001	.042	-.015	-.016	.000	
Q28.4	-.022	.007	.005	-.038	.010	.016	-.016	.016	.018	-.010	.003	.002

Standardized Residual Covariances (Group number 1 - SISP Maturity - Full SAM Model)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
Q45.7	.000											
Q26.2	-.020	.025										
Q24.4	.503	.044	.000									
Q36.4	-.496	.242	-.333	.000								
Q36.3	-1.416	-1.459	-1.202	.000	.000							
Q44.5	.093	-.199	.241	-.610	.291	.000						
Q18.5	.930	-.063	.519	.573	.581	.000	.000					
Q30.4	.000	-.177	-.613	.046	.747	-.678	-.222	.000				
Q20.5	-1.136	.956	1.617	-.003	.340	-.554	-1.572	.577	.000			
Q23.1	1.122	.317	-.123	.022	-.324	.493	.543	.652	.000	.000		
Q28.1	-.686	.024	-.529	.641	1.419	-.174	-.025	1.564	-.778	-.853	.000	
Q28.4	-.781	.100	.082	-.774	.211	.652	-.621	.584	.869	-.515	.055	.033

Factor Score Weights (Group number 1 - SISP Maturity - Full SAM Model)

	Q45.7	Q26.2	Q24.4	Q36.4	Q36.3	Q44.5	Q18.5	Q30.4	Q20.5	Q23.1	Q28.1	Q28.4
SISP	.023	.014	.013	.028	.020	.034	.025	.016	.049	.059	.031	.013
Effectiveness	.022	.014	.013	.030	.021	.033	.024	.016	.051	.062	.031	.013
Manoeuvrability	.019	.007	.012	.022	.016	.069	.051	.013	.038	.046	.062	.032
Efficiency	.264	.196	.137	.051	.037	.063	.046	.186	.087	.106	.074	-.015
Time_Dimension	.009	.004	.006	.011	.008	.305	.224	.007	.019	.023	.031	.016
Collaboration	.023	.014	.013	.356	.255	.034	.025	.016	.052	.063	.032	.013
Stakeholders'_Designation	.107	.406	.272	.023	.016	.033	.024	.076	.039	.047	.065	-.080
Viability	.034	-.025	.038	.033	.023	.098	.072	.024	.056	.067	.436	.246
Technology	.316	.032	.022	.008	.006	.010	.008	.222	.014	.017	.012	-.002
Form & Content	.011	.007	.006	.015	.011	.016	.012	.008	.255	.309	.015	.006

Modification Indices (Group number 1 - SISP Maturity - Full SAM Model)

Covariances: (Group number 1 - SISP Maturity - Full SAM Model)

			M.I.	Par Change
d2	<-->	r2	1.023	-.033
d1	<-->	r2	1.233	.016
e8	<-->	r1	1.099	-.006
e8	<-->	d5	2.119	.013
e8	<-->	d2	1.416	-.021
e8	<-->	d6	2.996	-.033
e5	<-->	e8	1.513	.026
e4	<-->	d3	1.396	.044
e4	<-->	e6	2.672	.062
e3	<-->	r3	3.412	.019
e3	<-->	r2	4.284	-.074
e3	<-->	d3	4.388	-.077
e3	<-->	d6	2.719	.054
e3	<-->	e8	2.683	-.031
e3	<-->	e6	2.789	-.063
e10	<-->	e4	1.340	-.020
e9	<-->	e8	1.778	.014
e7	<-->	d5	2.518	-.014
e7	<-->	d6	4.844	.043
e7	<-->	e5	1.594	-.027
e7	<-->	e3	3.308	.035
e1	<-->	d5	3.339	-.012
e1	<-->	d3	3.661	.032
e1	<-->	d4	2.470	-.011
e1	<-->	e8	5.828	-.021
e1	<-->	e5	4.886	.036
e1	<-->	e9	4.198	-.017
e2	<-->	d5	2.192	.009
e2	<-->	d6	1.812	-.019
e2	<-->	d4	3.070	.012
e2	<-->	e8	4.544	.017
e2	<-->	e5	1.723	-.020
e2	<-->	e9	1.294	.009
e11	<-->	d2	3.926	.058
e11	<-->	d1	2.488	-.020
e11	<-->	e8	1.501	-.023
e11	<-->	e5	1.140	-.038
e11	<-->	e3	1.594	.040
e11	<-->	e7	4.583	.040
e11	<-->	e1	1.527	-.018
e12	<-->	d2	1.686	-.039
e12	<-->	e4	2.631	-.054
e12	<-->	e10	2.137	.026
e12	<-->	e9	1.341	-.021
e12	<-->	e1	3.651	.028

Variances: (Group number 1 - SISP Maturity - Full SAM Model)

			M.I.	Par Change

Regression Weights: (Group number 1 - SISP Maturity - Full SAM Model)

			M.I.	Par Change
Q45.7	<---	Collaboration	1.541	-.066
Q45.7	<---	Viability	1.966	-.064
Q45.7	<---	Q36.3	3.057	-.054
Q45.7	<---	Q18.5	1.316	.067
Q45.7	<---	Q20.5	3.501	-.135
Q45.7	<---	Q23.1	1.017	.077
Q45.7	<---	Q28.1	2.283	-.046
Q45.7	<---	Q28.4	1.488	-.036
Q24.4	<---	Q20.5	2.838	.234
Q36.4	<---	Q26.2	1.148	.041
Q36.4	<---	Q28.4	1.183	-.054
Q36.3	<---	Efficiency	1.533	-.106
Q36.3	<---	Stakeholders'_Designation	3.038	-.104
Q36.3	<---	Viability	1.513	.095
Q36.3	<---	Q45.7	1.953	-.125
Q36.3	<---	Q26.2	3.769	-.074
Q36.3	<---	Q24.4	1.691	-.054
Q36.3	<---	Q28.1	1.997	.073
Q44.5	<---	Q28.4	1.075	.028
Q18.5	<---	Q45.7	1.301	.057
Q18.5	<---	Q20.5	2.416	-.106
Q30.4	<---	Maneuverability	1.117	.215
Q30.4	<---	Collaboration	1.107	.056
Q30.4	<---	Viability	3.150	.081
Q30.4	<---	Q36.3	3.069	.054
Q30.4	<---	Q20.5	1.077	.076
Q30.4	<---	Q28.1	4.781	.067
Q30.4	<---	Q28.4	1.086	.031
Q20.5	<---	Time_Dimension	1.859	-.122
Q20.5	<---	Stakeholders'_Designation	1.201	.029
Q20.5	<---	Q45.7	2.870	-.068
Q20.5	<---	Q24.4	3.867	.036
Q20.5	<---	Q18.5	4.384	-.093
Q20.5	<---	Q28.4	1.557	.028
Q23.1	<---	Technology	1.487	.087
Q23.1	<---	Q45.7	3.604	.072
Q23.1	<---	Q18.5	1.544	.052
Q28.1	<---	Collaboration	2.007	.126
Q28.1	<---	Form & Content	1.036	-.239
Q28.1	<---	Q36.4	1.745	.068
Q28.1	<---	Q36.3	2.611	.084
Q28.1	<---	Q30.4	2.645	.146
Q28.1	<---	Q20.5	1.800	-.163
Q28.4	<---	Q36.4	2.046	-.077
Q28.4	<---	Q44.5	1.019	.105
Q28.4	<---	Q20.5	2.290	.192

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
SISP Maturity - Full SAM Model	34	56.157	44	.103	1.276
Saturated model	78	.000	0		
Independence model	12	693.628	66	.000	10.510

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
SISP Maturity - Full SAM Model	.021	.965	.937	.544
Saturated model	.000	1.000		
Independence model	.145	.635	.569	.538

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
SISP Maturity - Full SAM Model	.919	.879	.981	.971	.981
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
SISP Maturity - Full SAM Model	.667	.613	.654
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
SISP Maturity - Full SAM Model	12.157	.000	35.534
Saturated model	.000	.000	.000
Independence model	627.628	546.759	715.945

FMIN

Model	FMIN	F0	LO 90	HI 90
SISP Maturity - Full SAM Model	.217	.047	.000	.137
Saturated model	.000	.000	.000	.000
Independence model	2.678	2.423	2.111	2.764

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
SISP Maturity - Full SAM Model	.033	.000	.056	.881
Independence model	.192	.179	.205	.000

AIC

Model	AIC	BCC	BIC	CAIC
SISP Maturity - Full SAM Model	124.157	127.750	245.220	279.220
Saturated model	156.000	164.244	433.733	511.733
Independence model	717.628	718.896	760.356	772.356

ECVI

Model	ECVI	LO 90	HI 90	MECVI
SISP Maturity - Full SAM Model	.479	.432	.570	.493
Saturated model	.602	.602	.602	.634
Independence model	2.771	2.459	3.112	2.776

HOELTER

Model	HOELTER .05	HOELTER .01
SISP Maturity - Full SAM Model	279	317
Independence model	33	36

Appendix G

Hypothesis H14
Organisational Size versus SISP Maturity

Regression Weights

			Estimate	S.E.	C.R.	P	Label
Size of Organisation	<---	SISP Maturity	1.000				
Q12	<---	Size of Organisation	1.000				
Q11	<---	Size of Organisation	.848	.064	13.283	***	par_1
SISP_levels	<---	SISP Maturity	.370	.083	4.476	***	par_2
Q10	<---	Size of Organisation	.795	.077	10.296	***	par_3

Residual Covariances

	SISP_levels	Q12	Q11	Q10
SISP_levels	.000			
Q12	.039	.000		
Q11	-.003	-.005	.000	
Q10	-.074	-.009	.015	.000

Hypothesis H1
SISP Benefit versus SISP Maturity

Regression Weights

			Estimate	S.E.	C.R.	P	Label
Benefit of SISP	<---	SISP Maturity	1.000				
Q41.5	<---	Benefit of SISP	1.000				
Q41.4	<---	Benefit of SISP	.948	.058	16.299	***	par_1
Q41.6	<---	Benefit of SISP	.932	.054	17.121	***	par_2
SISP_levels	<---	SISP Maturity	.475	.070	6.748	***	par_3
Q41.8	<---	Benefit of SISP	1.011	.057	17.842	***	par_4
Q41.13	<---	Benefit of SISP	.991	.057	17.342	***	par_5

Residual Covariances

	Q41.13	SISP_levels	Q41.5	Q41.6	Q41.4	Q41.8
Q41.13	.000					
SISP_levels	-.037	.000				
Q41.5	.000	.042	.000			
Q41.6	.011	.002	-.029	.000		
Q41.4	.034	-.050	-.027	.078	.000	
Q41.8	-.010	-.003	.020	-.003	-.037	.000

Hypothesis H4

SISP Alignment versus SISP Maturity

Regression Weights

			Estimate	S.E.	C.R.	P	Label
SISP/Business_Alignment	<---	SISP Maturity	1.000				
Business/SISP_Alignment	<---	SISP Maturity	1.088	.138	7.860	***	par_10
Q36.1	<---	SISP/Business_Alignment	1.000				
Q36.3	<---	SISP/Business_Alignment	1.033	.092	11.262	***	par_1
Q36.7	<---	Business/SISP_Alignment	1.000				
Q36.10	<---	Business/SISP_Alignment	.826	.121	6.821	***	par_2
Q36.11	<---	Business/SISP_Alignment	1.044	.123	8.474	***	par_3
Q36.5	<---	SISP/Business_Alignment	1.293	.111	11.679	***	par_4
Q36.6	<---	SISP/Business_Alignment	1.098	.135	8.148	***	par_5
Q36.12	<---	Business/SISP_Alignment	.931	.107	8.738	***	par_6

			Estimate	S.E.	C.R.	P	Label
SISPlevel	<---	SISP Maturity	1.000				
Q36.4	<---	SISP/Business_Alignment	1.197	.121	9.885	***	par_7

Residual Covariances

	Q36.4	Q36.12	Q36.6	Q36.5	SISPlevel	Q36.11	Q36.10	Q36.7	Q36.3	Q36.1
Q36.4	.007									
Q36.12	.069	.000								
Q36.6	-.006	.015	.006							
Q36.5	-.004	.015	.035	.005						
SISPlevel	.001	-.001	-.039	-.020	-.019					
Q36.11	.010	-.018	-.042	-.002	-.036	-.001				
Q36.10	.039	-.019	-.133	-.032	-.052	.062	.000			
Q36.7	-.013	-.005	-.112	.028	-.011	.021	.026	.000		
Q36.3	.013	.037	.016	.025	.039	.052	-.020	.028	.036	
Q36.1	.038	.053	.038	.064	.051	.059	-.037	-.005	.056	.075

Hypothesis H2

SISP Alignment versus SISP Maturity

Regression Weights

			Estimate	S.E.	C.R.	P	Label
SISP Approach	<---	SISP Success	1.000				
Q21.6	<---	SISP Approach	1.095	.171	6.422	***	par_1
Q21.4	<---	SISP Approach	1.174	.164	7.146	***	par_2
Q21.3	<---	SISP Approach	1.135	.148	7.663	***	par_3
Q21.2	<---	SISP Approach	1.000				
Q21.5	<---	SISP Approach	1.003	.162	6.201	***	par_4
Q42.1	<---	SISP Success	1.000				

Residual Covariances

	Q42.1	Q21.4	Q21.6	Q21.5	Q21.3	Q21.2
Q42.1	.000					
Q21.4	-.020	.000				
Q21.6	-.006	.008	.000			
Q21.5	.008	.005	-.015	.000		
Q21.3	.020	-.012	.019	.005	.000	
Q21.2	.059	.004	-.028	-.005	.000	.000

Hypothesis H11

SISP Content versus SISP Maturity

Regression Weights

			Estimate	S.E.	C.R.	P	Label
SISP Content	<---	SISP Maturity Level	.057	.015	3.854	***	par_2
Q19.4	<---	SISP Content	5.764	1.063	5.422	***	par_1
Q28.2	<---	SISP Content	1.000				
Q28.1	<---	SISP Content	1.095	.258	4.252	***	par_3
Q28.3	<---	SISP Content	1.152	.218	5.288	***	par_4
Q19.3	<---	SISP Content	4.397	.824	5.333	***	par_5
Q19.5	<---	SISP Content	4.776	.903	5.288	***	par_6
SISP_levels	<---	SISP Maturity Level	1.000				

Residual Covariances

	Q19.5	Q19.3	Q28.3	Q28.1	SISP_levels	Q19.4	Q28.2
Q19.5	.000						
Q19.3	-.011	.000					
Q28.3	-.035	-.018	.004				
Q28.1	.000	.011	.008	.000			
SISP_levels	.029	-.012	.010	.031	.000		
Q19.4	.003	.011	.014	-.017	-.018	.000	
Q28.2	.012	-.007	.006	.010	.034	-.012	.000

Hypothesis H7

SISP Policy versus SISP Success

Regression Weights

			Estimate	S.E.	C.R.	P	Label
SISP Cultural_Policy	<---	SISP Success	1.000				
Q33.4	<---	SISP Cultural_Policy	1.000				
Q33.5	<---	SISP Cultural_Policy	.851	.050	16.964	***	par_1
Q42.1	<---	SISP Success	1.000				
Q33.7	<---	SISP Cultural_Policy	.896	.057	15.610	***	par_2

Residual Covariances

	Q33.7	Q42.1	Q33.5	Q33.4
Q33.7	.000			
Q42.1	.026	.000		
Q33.5	-.016	.028	.000	
Q33.4	.007	-.032	.003	.000

Hypothesis H8

SISP Team Knowledge versus SISP Success

Regression Weights

			Estimate	S.E.	C.R.	P	Label
SISP Team Knowledge	<---	SISP Success	1.000				
Q20.2	<---	SISP Team Knowledge	1.000				
Q20.3	<---	SISP Team Knowledge	.971	.049	19.971	***	par_1
Q20.6	<---	SISP Team Knowledge	1.008	.051	19.639	***	par_2
Q20.5	<---	SISP Team Knowledge	.952	.051	18.783	***	par_3
Q42.1	<---	SISP Success	1.000				
Q20.1	<---	SISP Team Knowledge	1.009	.047	21.421	***	par_4

Residual Covariances

	Q20.1	Q20.5	Q20.6	Q42.1	Q20.3	Q20.2
Q20.1	.000					
Q20.5	-.010	.000				
Q20.6	-.002	.000	.000			
Q42.1	.008	-.024	.007	.000		
Q20.3	-.014	.028	.020	-.010	.000	
Q20.2	.021	-.014	-.022	.008	-.008	.000